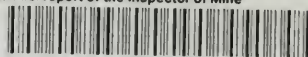


1

DOCUMENTS

MONTANA STATE LIBRARY
R 622.08 M8R1 9th, 14th
Biennial report of the Inspector of Mine



3 0864 00043673 6

NOV 18 2008

DEC 18 2008

WITHDRAWN
LIBRARY
Montana State College
BOZEMAN

100

BIENNIAL REPORT
OF THE
INSPECTOR OF MINES

OF THE
State of Montana

For the Years

1909-10

WILLIAM WALSH, Inspector.

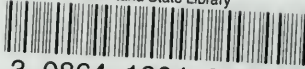
WILLIAM OREM, Deputy Inspector.

DECEMBER 1, 1910

"INDEPENDENT PUBLISHING COMPANY, HELENA, MONTANA."



Montana State Library



3 0864 1004 9046 8

This Book is the Property
of the Library of the Montana
State College of Agriculture
and Mechanic Arts.

Call Number

Accession Number

BIENNIAL REPORT
OF THE
INSPECTOR OF MINES
OF THE
State of Montana

For the Years

1909-10

WILLIAM WALSH, Inspector.

WILLIAM OREM, Deputy Inspector.

DECEMBER 1, 1910

"INDEPENDENT PUBLISHING COMPANY, HELENA, MONTANA."



Helena, Montana, December 1st, 1910.

To the Honorable

Edwin L. Norris,

Governor of Montana.

Sir—I beg to transmit you herewith my report as Inspector of Mines for Montana, together with that of the Deputy State Mine Inspector, for the year ending November 30th, 1909-1910.

Very Respectfully,

WILLIAM WALSH,

State Inspector of Mines.

CONTENTS.

	Page.
Introductory	5-12
U. S. Geological	12-14
Legislation and Recommendations	14-15
Mine Regulation Board	15
Condition of Mining from a Labor Standpoint	16
For the Improvement of Ventilation	17-20
Importance of Good Ventilation	20-22
Safeguarding the Health of Miners	22
Sanitary Conveniences	23
Gases in Metalliferous Mines	23-25
Liability of Mine Owners	25-27
Mine Inspection a Benefit	27-29
Electrically Equipped Mines	29-30
How Mining Is Done and Conducted	30-31
Mining Investments	31-32
Mining and Conservatism	32-33
Safety Appliances in Mines	33-34
To Safeguard Against Accidents	34-36
Accidents	36-38
Number of Mines Inspected, 1909	40
Number and Causes of Accidents	40
Number of Mines Inespected, 1910	41
Number and Causes of Accidents	41
Mines Inspected, Men Employed, Accidents and Percentages	41
Non-fatal Accidents	41
Fatal Accidents, Their Nature and Where Occuring for the Year 1909	43-44
Non-fatal Accidents, Their Nature and Where Occuring for the Year 1909	45
Fatal Accidents, Their Nature and Where Occuring for the Year 1910	46-47
Non-fatal Accidents and Where Occuring for the Year 1910	48
Montana's Metal Output	49
Mineral Output of the United States	50
Mine Production of Associated Metals in Montana	51
Placer Mining	52

Counties—

Broadwater	53-57
Beaverhead	57-58
Cascade	58-60
Chouteau	60-62
Deer Lodge	62-65
Fergus	65-70
Flathead	70-71
Granite	71-75
Jefferson	75-84
Lewis and Clark	84-90
Lincoln	91-93
Meagher	94-95
Missoula	95-98
Madison	98-105
Park	105-107
Powell	107-109
Ravalli	109-110
Sanders	110-112
Silver Bow	113-130

Introductory.

The inspectors take this opportunity of thanking the several managements for courtesies extended to them to properly make the necessary inspections. In my investigations at the mines I have everywhere been courteously received and assisted by those in charge. An assistance which has gone far towards enabling me to properly discharge my official duties with comfort and dispatch, and for this courtesy I beg to return an appropriate acknowledgment to the several managements.

During the annual tour of inspection I found the majority of the mines operated in a fairly safe condition, the matter of ventilation having been taken into consideration and this has greatly improved conditions in a great many of the mines in the Butte district which has come about by the properties being controlled under the same management, thus eliminating the friction heretofore existing causing the obstruction of air courses. There has been a large amount of money expended in installing electrical appliances and in various other ways in order to accomplish the desired results. The conditions have been noticeably improved in a majority of the mines in the district, but aside from what has already been done there is a great deal yet to be accomplished in order to bring the mines up to a safe standard in regard to the health of the miners by applying the various remedies set out in the recommendations.

In a great many of the mines mechanical means have been employed to assist the natural means of ventilation which has proven to be beneficial if the proper assistance is given to assist the air current where most needed. Mechanical means of ventilation have proven successful in coal mining and there is no reason why it cannot be applied to assist ventilation in the metalliferous mines of the state when required, an effort being made by the miners for the enactment of a sanitary law for the preservation of the health of the miners was ignored by the last legislature. This action on the part of the last legislative assembly is indeed discouraging to laws which

affect the miner. Such laws, if enacted, would hardly fail to reduced to a minimum a certain element of disease occurring among the miners, and until such laws are on the statute books in our state and made mandatory by reason of a suitable penalty being provided for their violation the best efforts of this department will be of little avail governing ventilation and sanitation and so long will the inspector's recommendations be complied with or ignored just so far as they favor or meet the approval of the managements.

A comparison of the mining industry throughout the state during the last two years exhibits a slight decrease in the number of men employed although various new companies have been lanchèd in several districts throughout the state, but operations are not as extensive in a great many districts as in former years owing to the depreciation in value of the various ores found in the state. Better methods have been employed in the recovery of values in the ores in mining, milling, smelting, cyaniding, and the combination of these and other processes which are being applied to the recovery of values contained in the ores of this state. The results of the improvements in this direction are of incalculable benefit to the chief industry of our state and as a result several old mines, after a long period of inactivity, have again resumed operations and are yielding handsome profits from a class of ores that were worthless to their early operators. At the time gold, silver, lead and copper had been discovered but little had been done in the way of their devolpment other than the securing of gold from the placer deposits and the most superficial prospecting of quartz leads. Much was hoped for in those early days but the most sanguine never dreamt of such accomplishments as the period since that time has witnessed. The growth of the mineral industry has been little less than fabulous and while the achievements have been truly marvelous the industry is only yet in its infancy. Each succeeding year not only reveals new deposits of marketable minerals but with it also comes improved methods of the mining of the treasure from the earth that increases former products and so cheapens them as to permit of competition with the most favored of other countries of the world. Already our copper has dominated the foreign markets and the keen sighted capitalist, in the possession of wonderful properties is coming

here to take part in the great task of mining and manufacturing so as to be upon an equal footing with the enterprising and vigorous American.

No other state has made such strides in the production of copper as has Montana. Twenty or twenty-five years is indeed a brief period as compared with the efforts of other copper districts but it has been long enough to make the name of Montana famous in all lands and one that must redound to future growth and even more rapid development which must be done in order to demonstrate the greatness of the mineral wealth in the state. While Montana has not the deepest shafts it has the richest ore and the greatest abundance, and its mines, mills and smelters are equipped with the most modern machinery and every mechanical device and economy that native or foreign ingenuity can conceive.

In the mining of its minerals Montana gives employment to a large army of men while in the collateral industries and associated with the transporting of the product to market thousands of people are employed. The capital invested in the industry is enormous. It is not an easy matter to correctly estimate it because of the many changes constantly taking place. The rapid growth of the great industry demonstrates the enterprise and energy of those whose capital and vigorous efforts have in such short time placed Montana in the front ranks of mineral producing districts of the world. Few residents of Montana, however, have anything like a proper conception of the greatness of their own state from a mineralogical point of view. Even those who live among the mines would be surprised at the volume of business annually done. They see the trainloads of ore going out day after day but pay but little heed to them. They see the corded piles of copper plate and pig being loaded for transportation to market but they seldom stop to consider the hazardous occupation of the miners who produce this enormous tonnage.

During the past two years there has been more attention paid to values of zinc ores and to a study of the processes for their profitable treatment. A plant for the reduction and treatment of the several ores containing zinc would be a great benefit to the mining industry of the state. W. A. Clark has built a small plant in connection with the concentrators at Butte which is, and has proven, a success and a great benefit

to the Butte district. This is of more than passing importance to the state as there are several districts within its boundaries where the ores exist while carrying good values of precious metals and in several instances a large percentage of copper are temporarily rendered valueless by reason of the high charges made at the smelters in the form of zinc penalties. With the operation of a proper plant these penalties will disappear and in their stead the zinc will be a value to add to the united worth of the ore.

Zinc ores are found in the Butte district and in immense quantities in Jefferson county, which would come rapidly to the front as a mineral producer. Also in the Rimini district in Lewis and Clark county the same conditions exist. There are a number of mines already opened in these counties, such as the Gray Eagle, the Comet near Boulder, the Alta at Wickes and numbers of others that have an abundance of this class of ores already for shipment and in condition to continue the production for an indefinite period. The profit arising from this class of ore comes from the fact that it can be produced at a lower cost than the zinc ores of Missouri and other distinctly zinc producing districts, because of the gold and silver and other valuable metals contained making it a very profitable product.

When one takes a glance at the history of the two years' work accomplished in Silver Bow county and in several of the other counties in the state the impression left is one of confidence in the future of the mining industry, provided the same self-reliance on the part of the operators of mines and those who direct the mining policy of the state is forthcoming and we see not the slightest reason for thinking anything to the contrary. Montana in the past has produced many millions in gold, why should she not in the future repeat that history in the event new discoveries are made and the advance of metallurgical knowledge, the discovery of new processes to cheapen the cost of treatment and win from refractory ores the metal contents. There is evidence from many sources which goes to warrant the conclusion that 1909 has been a forerunner for 1910 as a progressive and prosperous year in mining throughout the entire state. This only signifies that so much rich stuff has been extracted to date. The more there is taken out the less remains. The moral to be drawn

from this is that the future of the industry lies in the successful exploration of the grade of ores. The proportion of the gold distributed in dividends would in the case of this class of ores be small compared with what is paid away at present, but on the other hand it would mean the bringing within the payable limit large deposits which fall just short of the payable limit at present and what is of more importance still to the country engaged in mining, a future reduction in costs would bring about the desired end and that is to probably how it will be achieved. One cannot tell in what shape or form the reductions of a year ahead will be reached, but it may be safely assumed that they will be brought about without injuring the industry in any way. The evolution from a prospect to a paying mine is carried on in this state through the various stages in a gradual and systematic manner. There is nothing in the history of a vast majority of the dividend paying mines of today from which the most imaginative can weave an exciting tale. No poor prospector has of late years stumbled onto a body of ore containing fabulous wealth. In fact, accidental discoveries are rarely heard of and the question of luck as a factor in mining is nearly, if not altogether, eliminated. Take the list of the present producing mines and it would be difficult for the owners, or those who have succeeded to rights of the original locators, to tell when and under what circumstances the mines were discovered and because the great majority of them are the outgrowth of the economic geological conditions by which they are surrounded and not because of any marked indications exhibited on the outcrop and it may be truly said of such mines that they were made and not discovered.

The conditions surrounding modern life have created in many a desire to get rich in a hurry and to provide a means for such wealth mining stocks have become popular. Fortunes have been made from them. Many hear of the success attained by a few in mining enterprises because such information has been heralded to all parts of the country, but scarcely anybody learns of the failures for they are rarely published for this reason. The average layman is unfamiliar with conditions in mining as they actually exist and so mining stocks continue to afford a fruitful means of speculation. Only few people are familiar with the principles governing successes and fail-

ures in mining and with the methods employed by promoters in handling mining securities. There is perhaps no pursuit where there are better opportunities for making large fortunes from good investments or where failures result more frequently from unbusinesslike methods than in the operation of mines and nowhere do unscrupulous promoters have better opportunities for securing money from people than inducing them to speculate in mining stocks.

It can be said of the prospectors who have gone forth and found valuable deposits of ore and are still engaged in locating mines we owe a debt of gratitude which can never be paid. From their discoveries the world has been commercially enriched in a greater measure than from any other source, yet many of the early locators of mines were illiterate and the most common of men. Their discoveries were generally made through accident and not from a scientific knowledge of minerals. The history of many of these early discoveries and of the men who made them forms an interesting mining romance. The early prospectors seldom lived to enjoy the fruits of their labors and there is a long list of those whose lucky discoveries were followed by a fatal stroke. Thus Brodie, the finder of the Standard mine in California, perished in a snow storm. Story, another successful California prospector in early times, was killed by Indians. Comstock, who prospected the wonderful lode which bears his name, became almost a pauper and shot himself while in search of other mines. Fairweather, the discoverer of Alder Gulch, one of the many great discoverers, died from dissipation and exposure. Farrell, who discovered the Meadow Lake region, died from insanity. Scores of other names might be added to the list many of whom were men of violence and shared the fate of their companions. They are remembered only by reason of their discoveries. When a meritorious discovery is made and the fact becomes known to the outside world a great influx of people always follows in search of other ore deposits in the vicinity. A new mining camp composed of prospectors thus springs into existence, and as valuable deposits of mineral are opened up and developed some men come as miners and others in search of work outside of mines. Soon a flourishing community is established and intelligent people build homes and surround themselves with the comforts and luxuries of civilization. At the

richest and most lasting of these locations are finally developed prosperous cities such as Helena, Butte and several others which are scattered over the state. All of which can be attributed to the prospector of the early time. While the West has thus been made by the miners and her magnificent cities built by their profits, some of the finest structures in the East were also built from their ores. Lead City and Deadwood in South Dakota have been made prosperous communities by the profits from the Homestake and other mines in the northern Black Hills. Butte City with numerous copper mines has become one of the wealthiest cities of the entire West from the profits of the ores of the district and her population is said to contain a larger percentage of college bred men than any other community of its size that is isolated from university centers and has attributed to the welfare of the surrounding points in the state.

The wonderful growth of Seattle in recent years has been largely by reason of its unsurpassed shipping facilities, for through that port many of the supplies and much of the machinery for Alaska mining has been sent, while the profits of the mines at that great Northwest territory have centered in the city and added much to its beauty, grandeur and commercial activity. These are but isolated instances of the influence of mining in building cities and adding wealth to the nation, yet they serve to illustrate the fact that from the mineral wealth of the earth prosperous communities may be developed when skill and intelligence guide their work.

In the building of modern cities iron, steel, copper, lead and other metals together with concrete are now used in proportions unheard of in early times. Were it not for our iron mines these marvelous steel structures and our great transportation lines could not exist, without the development of the country we could not enjoy the vast electrical and other industries. The use of copper has contributed so largely to our civilization and comfort that without it we would still transact business by primitive methods, travel in ox carts and by team, have no street cars nor interurban systems of communication, be without telegraph and telephone lines and miss much of the enjoyment of life that comes from modern discoveries. Mining has made possible all these improvements and luxuries and gold and silver extracted from the earth have given our

currency a stability that makes the nation permanent. Were it not for such a standing our banking institutions would be very unreliable and business transactions would still be conducted through the medium of coonskins and barter.

The agricultural development of the region surrounding a mining community always follows the discovery and working of the mines for this is required to provide supplies for the people in a cheap manner. It is safe to say, in the light of these developments of the West, that mining through this means has been of untold benefit to the country as well as in the building of great cities and the accumulation of large fortunes. But mining has also, in a great measure, made possible the high degree of civilization of the people. The rise and fall of nations is often measured by the production of their mines. While the history of mining tells of the civilization of the times no nation has ever advanced in civilization without gold and silver because money is as essential to the up-building of the people as is language to the expression of thought. It takes money to perform the various functions of civilization and we require it to interchange the commodities and fruits of our labors. No other industrial occupation has contributed in greater measure to this intellectual development than mining and no part of this country can boast of a more intelligent or more highly educated people than the great West where so many mines are located. Many mining schools or mining departments of state universities and agricultural colleges have been established to meet the requirements of American conditions in mining and they have done much for the higher technical education of the people in the great West.

U. S. GEOLOGICAL SURVEY REPORTS.

The United States Geological Survey reports that in 1908 Montana produced \$3,057,640 in gold and 10,356,199 fine ounces of silver valued at \$5,488,785. The values of the precious metals produced in Montana in 1907 were \$3,286,212 in gold and \$6,149,619 in silver, so that there was a decrease in 1908 of \$228,572 in gold and of \$660,834 in silver, although there was an increase in quantity of silver of 1,038,594 fine ounces.

Beaverhead county shows a decrease in placer gold and silver but a notable gain in gold from deep mines. Broadwater county decreased its output from placer mines but increased its silver production and more than doubled its production of gold

from deep mines. Cascade county made a decreased output in both gold and silver. Chouteau and Flathead counties combined and Deer Lodge county, although showing slight decreases in both placer and deep mine gold, considerably increased their silver output. Fergus county decreased its placer production but increased its production of both gold and silver from deep mines. Granite county increased its production of both placer and deep mine gold and maintained the quantity of silver produced in 1908. In Jefferson county the production of both deep and placer gold materially decreased but in the quantity of silver produced there was a decided increase. Lewis and Clark county made decreased production of deep and placer gold and of silver. Madison county showed a large increase in the production of placer gold but a smaller output of deep mine gold and also of silver than in 1908. Meagher, Park, Carbon and Ravalli counties combined produced considerably less gold and silver in 1908 than did Meagher, Park and Ravalli counties in 1907. Missoula county produced less gold and considerably less silver than in 1907. Powell county largely augmented its placer gold production but the increase was more than offset by a greatly reduced deep mine production of gold in 1908, and a slightly reduced silver output. In Silver Bow county there was a materially reduced yield of placer and deep mine gold but an increase of about a million ounces of silver over the corresponding output of 1907. Statements elsewhere also show that from 1879 to 1909, inclusive, the values of copper produced in this state has been \$709,846.522, of silver \$192,769,151, and of gold \$12,851,276, a grand total of \$915,466,949. Thus do cold figures bring to the intelligent comprehension the colossal greatness of Montana's metropolis.

Montana in 1908 had five of its smelting plants in operation. Two copper plants at Butte, in Silver Bow county, one copper plant at Anaconda in Deer Lodge county, one copper plant at Great Falls in Cascade county and one lead plant at East Helena in Lewis and Clark county. All of the smelters except the copper plant at Great Falls do a custom business which provides them with almost sufficient ores needed to flux the product mined from their own properties. About 49 per cent of the crude ores smelted and 7 per cent of the concentrates were treated at custom plants in Montana, Idaho and Utah. Of the crude ore treated at custom smelters the siliceous, silver

and copper ores and the oxidized and sulphide iron ores comprised the larger part of the product, the remainder aggregating nearly 45,000 tons of ore and concentrates being treated at lead smelters. The production of ore in Montana in 1908 was 4,266,022 short tons, 83,310 tons of slag and flue dust. Some tailings were retreated by the cyanide process but in total were a small quantity. The average value per ton of gold and silver in the siliceous ore in 1908 was \$6.85 as against \$8.24 in 1907. In copper ore \$1.32 as against \$1.43 in 1907. In lead \$11.34 as against \$24.40 in 1907 and in copper-lead ore \$47.84 as against \$9.81 in 1907. The gold output of Montana for 1908 as reported by producers aggregated 147,913.34 fine ounces, which at the standard value per fine ounce amounts to \$3,657,640. Compared with figures for 1907 this indicates a decrease of 11,057.17 ounces in quantity and of \$228,572 in value. The yield of silver amounted to 10,356,199 fine ounces in quantity valued at \$5,488,785. The average value of silver per fine ounce in 1908 being 53 cents, compared with the figures of 1907 this indicates an increase of 1,038,594 in quantity and a decrease of \$660,834 in value.

The output of silver comes mainly from copper ores, from which sources was derived 8,274,451 ounces, of which Silver Bow county produced 98.7 per cent. The output of copper amounted to 251,667.795 pounds, valued at \$33,220,149. At the average price for the year of 13.2 cents per pound this shows an increase of 31,559,003 pounds for 1908 which is credited almost entirely to Silver Bow county, Broadwater and Jefferson counties supplying the next largest quantities. Montana has nineteen counties in which mine operations are carried on. Eighty-six mining districts have a production credited to them and later in this report a brief review is given of each of the productive counties.

SUGGESTIVE LEGISLATION AND RECOMMENDATIONS.

In accordance with the part of our inspections on the measures to be taken for the purpose of improving the ventilation and sanitation of mines we would recommend that a law be enacted by the Legislative Assembly governing all matters pertaining to the subject. Provisions for carrying into effect the recommendations such as protecting ore chutes in mines and all openings whether used as air or passage ways, by guard

or secured by open grizzleys. We are of the opinion most of them would be better embodied in the law itself. At any rate for some time to come until their successful working has been demonstrated. If the Board be appointed and our recommendations adopted they would then have every opportunity of modifying the regulations to prevent accidents and could arrange matters so that while the utmost would be done to secure the best possible state of ventilation and sanitation, unnecessary expense and hardships would not be forced upon mine owners.

MINE REGULATION BOARD.

It appears to us that the best means of obtaining the above and similar information and getting the general sentiment of the mining fraternity so as to give the necessary attention to all matters of ventilation and the health of the miners and their causes would be the appointment of a board which would arrange for investigations to be carried out from time to time by competent persons. In considering the question of legislation necessary for the improvement of the health conditions of the mines we have constantly been met with the difficulty of the difference of circumstances in different districts and in different mines of the same district. Guiding principles may be laid down. The extent to which these may be made applicable to individual cases so as to get the best result obtainable is a matter requiring circumspection and judgment in each instance. It seems to us that it is necessary to hand over details of application to a body with power to direct what must be done in any given case. The Inspectors of Mines already possess considerable authority in the matter but from the general sentiment it does not appear that the mining community would favor handing over to any one person the large powers that have to be exercised until a law has been framed and enacted governing such cases. The conditions, however, are strongly in favor of referring all matters of dispute as to what should or should not be done in matters of ventilation and sanitation to a board to which the miners could present their side which would give the board and all parties concerned a better understanding of the matter and they would abide by the board's decision which would be final as to what should be specified in the law governing all matters pertaining to safety.

THE CONDITION OF MINING FROM A LABOR STANDPOINT

In reviewing mining conditions from a labor stand-point it is necessary to condense one's opinions into a limited space. The last few years have not added what they should to the interest and well-being of the miners of the state. Our mines are getting deeper and as a consequence a more powerful system of ventilation is required. Most of the big mines are down to the 2000 and 2800 foot level. I am not in a position to say to what depth mining will be carried on but if it should continue until the 3000 foot mark has been reached it will not be a place for men to work in unless a more improved system of ventilation prevails. There are more explosives used in our mines per man than in any other mining camp in the United States. The quantity of explosives used the greater the need for ventilation. Fumes and smoke hang about for hours in a poorly ventilated place carrying the germs of all kinds of diseases with them. Foul and vitiated air is responsible for half the ills incidental to a miners' life and when he is compelled to work at high pressure the trouble is accentuated ten-fold. I do not for one minute say that the mines of this state are any worse ventilated than in the most mining districts of other states but I do assert that the pressure under which men have to labor is rendering it imperative that we should not be content with the old method of ventilation, if a more efficient system can be adopted which would provide a supply of pure air to all parts of a mine.

I cannot conclude this article without calling the attention of the Legislative Assembly to this most important question of ventilation. Up to the present there has not anything of vital importance been done. In the meantime miners' complaints have been rapidly increasing. Men at the age of 45 have to quit mining in search of more congenial employment and many of them cannot work at all and their existence has become merely a living death. The mines of Montana have earned millions of money in dividends and have made many men wealthy, surely it is a reasonable request of the miners to ask that a portion be at least expended in ventilation and sanitation in the mines of this state.

MEANS SUGGESTED FOR IMPROVEMENT OF VENTILATION.

Means suggested for the improvement of ventilation during development work and work being carried on some distance from the main air current.

In this state the main problem is the bettering of the ventilation of the metalliferous mines, especially those which are large and deep. The need being for the application of well known practices rather than for any new or less usual expedients the provisions larger air shafts and more of them, more powerful fans to assist the natural means of ventilation and more attention to keeping stopping and air doors to assist the air to travel where most needed are all that is necessary to make the ventilation as nearly perfect as possible. For exploring purposes ahead of the main work such cross-cuts, raises and drifts mechanical means should be employed. In order to carry air to the working faces the blasting being much heavier as a rule in such cases, ventilation pipes preferable by attaching a small fan or applying the steam or air jet to the pipe line in such cases, will improve the conditions materially. It very often happens that the main air course is entirely too small and so often becoming blocked. In every important mine there should be at least one or two air ways in addition to the shaft large enough in size to carry the necessary amount of air to supply all working places with the amount of air required and should be maintained quiet unobstructive from top to bottom of the workings and used for ventilation and traveling purposes only. In sections of mines where the ventilation is defective care should be taken to have two or several clear air passages from level to level in the mine in order to keep the air in motion. It may be most judicial and economical to drive the levels one hundred feet apart vertically or it might pay best to have them 150 or 200 feet apart. Intermediate drifts can be driven and several connections made by raising or by the sinking of winzes for the proper connections for ventilation and economical mining. Besides being advantageous for ventilation purposes a connection separate from the shaft which can be used as a traveling way in a safeguard for the workmen in the most impossible event of the main shaft being wrecked by an explosion, accident or fire. The sinking of winzes is of course also a well recognized

means of prospecting the ground and valuable from that point of view. In order to have the connections available at the earliest possible date we would recommend that the sinking of winzes should, whenever practicable, be carried out simultaneously with the shaft sinking and the driving therefrom so that the drive may connect early with the bottom of the winze, in order to ventilate that portion of the mine. In the system of ventilating mines by large fans either blowing air into a mine or by suction drawing the vitiated air out another system is often applied, especially in conjunction with natural ventilation. In the blowing system the pure air is confined until it reaches the working places through the workings and the fumes do not pass into the working places to any extent. When the air is blown in, however, there is an advantage in the fact that the current can be sent forward some considerable distance from the fan. Although the main ventilation of a mine may be very good it generally happens that development work must be carried on so far ahead of any possible connection that some means must be adapted to carry a current of air into them. This can occasionally be done by systems as has already been mentioned, but usually pipes of some sort are the most applicable method. Small fans and blowers driven by water power if available, or by a small compressed air engine or by an electric motor are often used successfully in such cases causing air to pass in from a well ventilated part of the mine and removing the vitiated air. They may be worked on the plenum or vacuum system as the operator may consider most advisable. Where there is a good deal of water allowed to pass from the higher levels to a pumping station lower down in the mine the water may sometimes be made use of at the lower level as a source of power, being brought down in a pipe and used on a small pelton wheel or other motor power. If high pressure water is available as above or can be obtained from a small pipe let into the rising main of a pump it is often utilized more simply by turning a jet into the mouth of a ventilating pipe. The jet driving the air forward. The jet may be similarly arranged to exhaust. In many cases of raising and sinking winzes the injector pipes alone would be required, the smoke being carried away by the natural current when it reaches the level. This plan might not give so high an efficiency as an electrically driven fan, but would

we think, be more adapted for rough usage of mine work and be a long advance on the use of the compressed air. Directly in the mains the injector system can be very cheaply attached. In case of gas in a mine which issues suddenly and in large quantities from the country into the mine, this would result in the air being regulated so as to pass in large volumes into the gassy places where it is required and in smaller quantities into the places free from gas. The obligation however, should be maintained reasonably pure air in all the working places and in the amount required to do so varies enormously in different parts of the same mine. The judging of the ventilation by the purity of the air in the working places is therefore just as logical and necessary in metalliferous mines as in coal mines and as the coal mines are more often ventilated directly by mechanical ventilation. Observations of temperature and humidity should regularly be made in all working places as both have a great deal to do with comfort and efficiency of the workers, consequently directly effect the cost of the work done. It is practically impossible to do continuous hard labor in an atmosphere saturated with moisture which is very warm. The temperature of the air in a mine is affected by the depth from surface, there being a small rise in temperature on account of the compression of the air in descending a depth as in several cases in the state and owing to the increase of barometric pressure by oxidations of minerals in the country, by the warming influences of men and animals, lights, decaying timber and firing of explosives and by the increase in rock temperature as depth is attained. On the other hand the air is cooled by contact with wet surfaces and the evaporation of moisture. The cooling effect of evaporation is of great importance enabling naturally hot places to be cooled down greatly by ventilation. In order that evaporation may be rapid the air must not be too much saturated with moisture to begin with and must be moving with some velocity and at the same time it should not be so dry as to rapidly absorb all the moisture from the rock surface and so cause dust to arise. The effect on health of temperature and humidity are merely matters of ventilation. To maintain both there must be a reasonable low temperature and a comfortable degree of humidity. Hot workings may be cooled by a good current of air from the surface. In fixing a limit of temperature for mine

workings, regard must be had to the natural rock temperature of each point and to the temperature of the intake air in the well ventilated parts of the mine. There did not appear to be any difficulty in obtaining a fair temperature even in the deepest levels. A temperature exceeding 70 degrees should be an unusual temperature in any well ventilated parts of a mine and should never be allowed to exceed without special reason being adduced to show that it was unavoidable. As a general rule it would be reasonable to require by regulation that the workings in or from any level should not be more than 5 degrees hotter than the air in the main intake air current of that level. The ventilation of winzes is usually simple. The cool air from the level goes down and the warmer air comes up.

Several bad accidents have happened in winzes which shows that the removal of fumes after blasting has sometimes been unsatisfactory. So long as natural ventilation alone is relied on there is liable at any time to be a cessation of air currents entering winzes and then they may be very dangerous to go into after firing. We think that in all winzes provision should be made for some effective mechanical means of ventilation. The evil influence on health of breathing over and over again the organic matter exhaled from the lungs is very disastrous but we would point out here that men working in a raise are in a very confined space and unless their air is constantly being renewed they must suffer. In an even greater degree the same bad effects have been noticed in persons confined to very small and unventilated rooms. The special necessity for improvement of the ventilation of raises is therefore very apparent.

IMPORTANCE OF GOOD VENTILATION.

Where so many conditions operate to lower the efficiency of workmen as in underground mining it is not only humane but good business policy to make the working conditions as good as possible. It is of the utmost importance in any branch of industry that the workmen have air to breath of the greatest possible purity, as any foreign gas in the air at least reduces the percentage of oxygen which may and often does act as a direct poison. Either condition reduces the mens' strength and necessarily lowers the quantity and quality of the work performed.

In mines where artificial ventilation by measure of fans is

resorted to it is possible to regulate the flow of air through the different parts of the workings so that each working place can be supplied with a fair amount of air. A well ventilated mine is a benefit to the miners in a number of ways as all poisonous gases are carried away or all injurious gases that are given off from the rocks or other material, from the breathing of animals and men and decaying offal and such as is produced from explosions. In this day when the ventilating of mines is so thoroughly understood, or at least should be, with the best makes of fans which are constructed and installed, the neglect of conducting the ventilation to the working forces of the mines is a crime against the health of the miners and a waste of money for the operator, as it is a well known fact that employees in a well ventilated mine can do more and better work than those in a mine where the ventilation is neglected and the atmosphere of the mine sluggish. From a financial point of view good ventilation is always economy.

In the metal mines natural ventilation is the rule, sometimes assisted by air from fans, air drills and other air driven machinery there being no explosive gases to contend with less air current is required than in coal mines but nevertheless the men must be protected from foul air, from respiration and from powder. Explosives when burned give off large volumes of gas containing carbon monoxide, carbon dioxide and other gases and vapors that quickly make the air unfit to breathe. It is therefore necessary for the men to wait after shooting until the air has cleared before returning to their work unless a good air current is provided and considerable time may thus be lost and the work retarded.

Good ventilation also serves to retard the decay of timbers and the difference in the amount of destruction of timbers from this cause is often marked between well and poorly ventilated parts of a mine as timbers cost is an important factor in mine economy and any means of reducing it are well worth taking into consideration.

Probably the most important factor in operating quartz mines successfully is the proper ventilation of the working places. In order to make the mine safe and to retain a sufficient force to keep up a large output all workings must be constantly supplied with fresh air in such quantities as to dilute, render harmless and carry away all smoke, foul air

and noxious and dangerous gases. In sanitary conditions above and below ground have already been dealt with but I desire to emphasize the fact that when we are endeavoring to improve the conditions under which miners work we must remember that we are dealing with less than one third of their time. It is therefore of great importance that the working places should be in healthy surroundings. The defective sanitation of mining is a matter that comes within the scope of legislation and the necessity of efficient sanitation under the law governing such conditions. The defective supervision of this important matter should be left to local boards as shows in another part of this report.

I have made my recommendations where necessary under each heading and I only desire to say in conclusion that my investigations have led me to the conclusion that the most urgent questions for consideration are the ones mentioned under the several headings.

SAFEGUARDING THE HEALTH OF MINERS.

While the important questions connected with the elimination of the dangers from accidents in mining are receiving wide attention there are other dangers to which miners are exposed which are worthy of far more consideration than they are receiving. These are conditions injurious to health. There are conditions present in many mines while not always immediate in their serious consequences which are nevertheless detrimental to the health of the men and which will with proper attention from both men and management be easily avoided. One of the great scourges of mining is miners' phthisic, or miners' consumption, a disease formerly brought on by the unsanitary conditions of the mines and by rock dust inhaled into the lungs. The preventives are to keep down the dust and provide better means of ventilation. The mine management can well afford to consider the health of employees. The work of a well man is better both by quantity and quality than that of one who is half sick. An essential requirement for the promotion of good health of miners is good ventilation of all parts of the mine in which men must work, to carry away dust and the poisonous gases produced by the explosives and to provide plenty of oxygen so that breathing is easy.

SANITARY CONVENIENCES.

In most of the larger mines it has been found that sanitary conditions are anything but satisfactory, in the opinion of the inspectors, and a number of them are positively injurious to the health of the miners. It is suggested in this connection that a tight zinc or iron box be made and placed on trucks so that it can be hauled about or placed in some abandoned cross-cut or drift apart from the places of operation. The stool should be covered with air-tight lids and should be taken to the surface every day to be cleaned and disinfected. One of these boxes should be provided for every level of every mine over 500 feet in depth. The places where men congregate to eat their lunches have often been found to be foul from waste food thrown carelessly about and allowed to remain and decay. A metal receptacle should be provided for all such places and its use strictly insisted upon.

Where horses are used underground the ways which they travel should be well drained and frequently cleaned and the stable should be well ventilated and thoroughly cleaned. The stable should be placed near a return air way so that the odor may not be carried through the workings of the mines. Levels used for travel ways or for the intake of air should be well drained of stagnant water and no water should be allowed to become pooled. Winzes and dams containing stagnant water should be slowly and carefully drained before work is resumed on them. In this way a sudden liberation of foul air from the water can be avoided.

I do not think that it requires any argument to convince any reasonable mind that the health of the employees cannot but suffer in consequence of these unsanitary conditions. I therefore strongly and earnestly recommend that a law be enacted which will provide some sanitary regulation in mines and underground workings as well as give the miners in a small measure at least the benefit of like sanitary laws obtaining and in force in our towns and cities.

GASES IN METALLIFEROUS MINES.

Gases in our metalliferous mines generally spoken of as bad air do not include the explosive gases common to coal mines. Neither does the term as generally used accurately define the condition of the air, as gas has accumulated in several mines

in Silver Bow county from the cause of fire which has retarded the workings of several of the properties and making it very dangerous to employees. Gas of an explosive nature was encountered in the Iron Mountain mine in Missoula county where an explosion took place injuring four men but not fatally. On making an investigation after the explosion all precaution was taken. I procured the services of an expert on explosive gases, the investigation being made by the use of safety lamps so as to determine if any explosive gases still remained in the tunnel. There was none remaining after the explosion, but we found plenty of black damp and for several weeks until the ventilation fan was put into operation. Candles could not be used in that portion of the workings for several weeks, lamps and torches being used. In opening up the air course, therefore, the view is generally advanced that an atmosphere that will not support combustion is unsafe and must not be ventured into and there is little doubt that the percentage of oxygen is doubtless four or five per cent below what will support the combustion of an ordinary candle and it must also be below what is required for a kerosene torch. The miners' measure of bad air is therefore a safe one provided the atmosphere be only adepted of oxygen and poisonous gases do not exist in dangerous quantities, the percentage of oxygen may however be sufficient to support combustion and the atmosphere be absolutely unsafe to human life. Upon entering the tunnel where the explosion had taken place nothing but a large size kerosene torch or a safety lamp could be used with any satisfaction. The air here might be good while near the back of the drift it was quite bad and soon produced a groggy feeling. Walking through a drift or tunnel thus charged would put the gas in motion and appear to separate it into waves. These waves were very noticeable upon the torch, which burned brightly or dimly as a wave of gas was succeeded by a wave of comparatively good air. If this stirring up of the air were continued for some time the waves of gas appeared to be broken up in small volumes and would eventually drive one from the tunnel and usually in the dark, the lamp or torch refusing to burn. One noticeable feature of this condition was the ability to breathe this mechanical mixture of air and nitrogen with but comparatively little inconvenience when at rest, and for a period of ten minutes time or more after it was

impossible to keep the torch burning. Very little physical exertion, however, in such condition of the air caused profuse perspiration and made the breathing and heart action harder than climbing ladders or a heavy grade on a mountain. Before turning in the fresh air a lamp would burn well as high as two and a half feet above the floor of the tunnel. The hose from the air pipe was carried to within about eight feet of the breast of the tunnel and the air cock turned wide open. Our lights were almost immediately extinguished and we were compelled to return to the main entrance of the tunnel. One or two days later attempts were made to reach the breast. The last effort was successful but without light. When the last effort was made the gas near the breast had been partially displaced but not until the fan and air line had been repaired and turned on, clearing the works of all explosive gases and bad air.

LIABILITY OF MINE OWNERS FOR INJURIES TO THEIR EMPLOYEES.

Extracts Taken From a Supreme Court Decision.

In order, however, that the mine owner be relieved from liability on the ground that the injury was the result of the negligence of a fellow servant with the party injured there must have been negligence on the part of the master. If an employee is injured by the combined negligence of the mine owner and of a fellow servant, the master is responsible for the injury. When the negligent acts of two parties concur in causing an injury the negligence of each is a proximate cause and it is immaterial that the negligence of another contributed to produce the damage. The case is one of joint tort feors and both are undoubtedly liable. As to those extraordinary dangers it is the duty of the master to warn his employees and there is no duty resting on a miner, risks which are open and obvious whenever he has or should, in the exercise of reasonable care have knowledge of a defect unknown to his employees and one which they could not reasonably be expected to discover. It becomes his duty to apprise them of this extra hazard and if need be to warn them of its danger. Thus it has been held to be the duty of the mine owner to warn his servants of charges of powder prepared by the men on another shift and not yet exploded and the same has been

held with reference to his duty to warn them of a blast in time to permit their escape and of a defect in mines known to the mine owner but not to his employees. Where the employee is a child or a person inexperienced in mining and thus unable to appreciate the danger, the mine owner owes him the duty of giving warning as to dangers which in case of an adult and experienced servant might be entirely unnecessary. We think it is now clearly settled that if a master employs a servant to do work in a dangerous place or where the mode of doing work is dangerous and apparent to a person of capacity and knowledge on the subject, yet if a servant employed to do the work of such a dangerous character or in a dangerous place, from youth, inexperience, ignorance or want of general capacity may fail to appreciate the dangers, it is a breach of duty on the part of the master to expose a servant of such character, even with his own consent, to such dangers unless he first gives him such instructions or cautions as will enable him to comprehend them and do his work safely with proper care on his part. The right of an employer to contract against liability for his negligence resulting in injury to his employees is controlled by considerations of public policy, much the same as those which prohibit him from delegating the responsibility for such negligence to another. It is held that such contracts are void and that neither by adopting rules nor by express agreement to that effect can a mine owner relieve himself of the responsibility to respond in damages for the failure to perform or for negligent performance of his duties owed by him to his employees. Closely connected with the duty of a mine owner to employ and retain none but competent servants is his duty to make reasonable rules for their conduct in relation to their work. One who employs servants in complicated and dangerous business is bound to prescribe rules sufficient for its orderly and safe management and his failure to do so is a personal negligence for the consequence of which he is liable to his servants.

This rule, however, is applicable only where the complexity or nature of the business renders the adoption of rules reasonably necessary. The mere failure to make and adopt rules is not proof of negligence unless it appears that the master in exercise of reasonable care should have foreseen and appreciated the necessity of this precaution. When such reason-

able rules are adopted and brought to notice of the employees, however, it is the duty of the latter to obey them and failure to do so will amount to contributory negligence. Where a mine owner assures his employees that the danger is not at all great the employee may well rely upon this assurance, unless he himself knows the contrary to be true or the danger is such that a reasonably prudent man would not have remained working even in the face of the employer's assurances of safety, nor does the owner of a mine discharge his duty by merely using reasonable care to originally render the premises safe. His duty is a continuing one and requires of him the same degree of diligence and care to maintain it in a condition reasonably free from danger to his employees. Equally well settled is the principle that the mine owner is bound to use diligence to supply his employees and equip his premises with machinery and appliances reasonably safe and must use reasonable care to preserve these appliances in a proper condition.

MINE INSPECTION A BENEFIT.

Mine inspections have come to be regarded as a reliable safeguard in large mining districts and the perfection of such a system is necessary for the welfare and safety of the miners. Since this has been established it would be difficult to say just how many lives have been saved by mine inspections or to what extent it reduced the death rate but many instances could be cited which are concrete examples of the manner in which the mine inspectors have prevented accidents in the mines and it requires but little demonstration to show that the whole decrease in the death rate from the first establishment of this office to the present time has come about solely through mine inspection. Some of this decrease has been due, however, to improved conditions and facilities which developed gradually in every mining district from its primitive state to that of maturity. There is no question before the American people today of greater importance than that of protection of the miners. In considering means for bringing pressure to bear first on the mine officials and secondly on the workmen, we have to view the subject from two aspects, the formulation of mining laws and the enforcement of them. As to the first aspect, mining laws must be drastic. Moral suasion will not produce results and preaching will have no lasting effect.

Penalties must therefore be imposed both for the owners and managers for neglect of duty and for workmen for disobedience of rules.

In order that the work of mine inspectors may prove effective in its results there must be not only good mining laws enacted but the vested authority to enforce the same. From long familiarity with the work of mine inspectors in this state I can assure you that the mine inspectors have to contend with many difficulties about which the general public is ignorant. The inspector should be a man of integrity, ability, mining knowledge and experience and should have the courage of his convictions. He should use good judgment and display tact and skill in dealings both with men and corporations. He should be a man of good knowledge which is absolutely necessary for the purposes of ordinary mine inspections. The present system of mining laws now in force in the state is not specific enough. I have given much thought to this phase of the question and believe that every mine should be operated under a set of regulations adopted by the mine management as best suited to the particular conditions in the mine. These mine regulations should be penalized by the state mining law. The legislative body which is about to convene should take cognizance of them and by the enactment make them a part of the state code and have them written on the statute books of the state.

Much of the aversion to an effectual inspection of mines, particularly in the west, arises from the fear that the officers will be political appointees and will be improperly vexatious in the discharge of their duties. This is not idle sentiment. I have discussed this matter with engineers of experience even from Australia, where mine inspection is a very much more serious matter than in this country. In the majority of our mining states the Inspectors are appointed by and receive their commissions from the governor or other state officials. In Pennsylvania and Idaho during the past few years the office of Mine Inspector has been an elective office, the Inspector being chosen by the vote of the people. The elective system of choosing the Inspector as compared with the appointive system has little to recommend its adoption in other states or its retention in Pennsylvania. It makes the Inspector more than ever a scheming politician and the work in his charge is

seriously handicapped when he is called to use his authority against those to whom he must look for support in the next election as a servant of the state. On the other hand, he is free to act in the capacity that his office demands. It is my conviction after carefully considering the work the Inspectors of Mines must perform and their relations to the state, the operator and the miner, that this official should be appointed by the governor or the state judiciary and for a life term, except as removed by order of the court for cause. That would relieve him from all political affiliations.

ELECTRICALLY EQUIPPED MINES.

One of the most important reasons explaining the fatal accidents in mines which are equipped with electrical machinery is the ignorance of the men sometimes in charge who are supposed to know about the details of the plant. I believe electric power is perfectly safe if properly understood and the wire kept properly covered so it may not come in contact with material and become charged, but I do not approve of the power for shaft sinking and condemn it for several known reasons. First there is no way of determining where the power has been cut off, that is to the engineer in charge until he applies the current which may be the critical moment when the miners have prepared to blast in the bottom of the shaft depending on the power to be hauled away, they setting fire to the fuse and the signal to hoist given before they can determine that anything has gone wrong, which leaves the men to face death in this terrible way. Second, it has been known to charge the entire cable from the hoist to the bottom of the workings which is very dangerous as the only way to determine this danger is by taking hold of the part charged which may result in death.

It may be economy in the cost of production to appoint an ordinary mechanic to fulfill the duties which an experienced electrical engineer might consider complex but eventually the mining company will be the loser and perhaps the defendant in lawsuits resulting from the negligence of its employees. The electrical equipment of a modern mine needs intelligent care during its installation and while in operation. Delegating the management of an electrical plant to an inexperienced person or even to mechanical engineers who might render

better service in their chosen vocation is to say the least playing with the fuse by jeopardizing not alone the lives of the other workmen in the mine but also creating an opportunity for shortening the profit earning period of the company. On the other hand, we believe that the employment of incompetent electricians by a mining company is unjust to the machinery manufactured, for there have been instances where better work could have been shown by newly installed apparatus had the men in charge understood the principles of electricity. The time is at hand when the mine engineer should learn how to operate electrical machinery for the safeguarding of the miners.

HOW MINING IS DONE AND CONDUCTED.

This article is written to give the general public an idea how mining is carried on, it not having the faintest idea of the hazardous occupation of the men who follow it for a living. The aim of the operator is to take out the ore at the lowest possible cost. In mining the work of developing new territory and of exploring the ore bodies already discovered is carried along at the same time. The work of prospecting is the main one at the beginning and at the end of the mine's life. It is necessary in the early days for the discovery of the ore bodies and a property is not closed down until the work of exploration which is done along in advance in a well conducted mine fails to expose new ore bodies. The ore bodies are reached by a main thoroughfare which is a shaft or a tunnel. Numerous drifts and cross-cuts and branches are driven in various directions to all portions of the mine where ore is being extracted. Winzes or small auxiliary shafts are sunk from some levels and raises from one level to another are the short cuts between levels and are used as air and traveling ways and for various other purposes. In good practice the ore bodies of one level are mined while in one or two levels below the developing of the ore bodies is carried on. New productive areas are discovered, the size and extent of the ore bodies are discovered and a drift driven that will permit the taking out of the ore in the cheapest and best way. Some drives are driven on the strike and fail to encounter the ore bodies which are hoped for along their course. During all of the time miners are compelled to work in the foulest kind of air until all the work mentioned has been accomplished and the mine properly opened

up so as to provide the means of ventilation. All of this work has to be properly timbered in order to protect all openings so that mining can be conducted systematically, and I want to impress on the minds of operators that ground which requires to be timbered should be closely lagged overhead as accidents due to fall of ground are likely to occur when the stopes are carried so high that there are large overhanging masses of unsupported material, the safety of which cannot be assured by frequent examinations and the removal of loose material as there is too much dependence placed on the ground to support itself. This tendency to shave down cost on material essential to safety in order to make favorable comparison on the production cost sheet requires to be continually combatted by the Inspectors.

MINING INVESTMENTS.

During the past years there has been great activity in mining investments and thousands of people have sought information on subjects that would enable them to act intelligently in making a choice of property in which to become interested. The great success attained by many who have invested cautiously in mining securities has created much of the enthusiasm but it has been stimulated by reading the reports issued by the state and the United States Geological Survey on the mineral resources of the country and by the wonderful discoveries made of paying properties by corporated organizations and private individuals. Indeed many people are just beginning to learn of the great opportunities for profit in mining. As all become better informed and have more money for investments they will take a still deeper interest in mining securities. Every investor before buying stocks should become thoroughly familiar with mining organizations as outlined in this chapter. In fact a mining proposition should be looked at in the same manner as any other real estate matter where investigations are made no matter whether the property is a prospect or a well developed mine and good judgment is exercised to secure capital. For in many parts of the country there is abundance of money ready for investment in meritorious properties. Whenever a scheme has to be taken to a distant part of the country to secure capital to develop it or when it requires unusual effort and unreasonable claims are put forth in attractive literature to get people to take stock

then it is a good principle and generally far safer to let it alone. In reading the prospectuses of some mining companies and the literature issued by some promoters the investor should remember that it is not all gold that outward shineth bright. Only fools are willing to take chances in wild-cat schemes.

MINING AND CONSERVATISM.

It is sometimes a question in mining whether to go ahead and risk it in a doubtful proposition or not to do anything. There are so many wrecks of plants and mills scattered over the mountains that a man may well be chary of venturing and yet "Nothing ventured nothing gained," and while in nearly all mining there is a large degree of risk, if no one had ever ventured and lost it is safe to say there would never have been successes. Although these monuments of indiscretion, inexperience and ignorance are not at all pleasant sights to look upon the failures have taught us many a lesson and by acting as horrible examples have been the stepping stones to ultimate success. Many milling and mining ventures have been undoubtedly foolish. There are others which have been justifiable according to men's lights and have yet turned out failures. It is these last which are of most interest and are most instructive. From a study of them we learn most of what not to do and what of improvements to make to produce profitable results. The wise man will certainly look before he leaps, will weigh the pros and cons, exhaust every source of information and enlist the best talent available, then go ahead prepared to overcome any obstacle which may appear. A man overly cautious, or intimidated by croakers, had better leave mining alone, for while there are many who have failed by rash adventure, there are many more who have succeeded with the aid of certain gambling audacity coupled with good luck. Mining engineers and geologists have endeavored to eliminate as much as possible the risk from the mining field by careful study of conditions, but they have not proven infallible and a man by setting their advice aside has at times won. More often, however, he would have escaped failure had he heeded their warnings. The science of mining geology is still young although it is advancing rapidly and of late years some notable discoveries have followed the application of scientific principles to mining. Nature is a treacherous mistress at best and often what indicates sure success turns out by experiment and ex-

perience to lack foundation. Therefore to win a man must couple courage and enthusiasm with conservatism. It is no discredit to a mining engineer to say sometimes "I don't know." He is often asked by persons having no conception of the difficulties involved in answering questions beyond human ken and problems come up which after he has exhausted every known resource he must let rest undecided. If the work must go on it will have to follow the line of greatest probabilities rather than a plan based on certainty. It is only the faker who knows it all, who is in league with nature and has a private knowledge of her secrets, who can tell you just what the vein is going to do a thousand feet from the surface and who dazzles the miner or investor with promises of richness with depth where richness does not exist at or near the surface. The more deeply we go into geological science and mine examination, the greater is our diffidence in making positive assertions. They so often turn out otherwise. Nature is not loath to play a joke on mankind and a plausible showing on the surface may often exist merely as a lure and at little depth fade out. On the other hand it has happened that a poor surface showing has unexpectedly developed into a bonanza with depth. Too often the investor places undue faith in the statements of the man who knows it all only to find after much expenditure of time and money and hope that the results and prognostications failed to coincide. There is a difference between "Don't know" of honest and reliable men than of the man who knows it all, than of a man who is well versed in his profession by long experience who appreciates the difficulties and knows too much to commit himself by positive assertions. "I think" and "It is probable" are generally safer expressions than "I know" and "I am sure."

SAFETY APPLIANCES IN MINES.

Hoisting apparatuses in mines such as cross heads, skips and cages have always been recognized as having an inherent element of danger and many efforts have been put forth to provide various means of safety. Our readers will doubtless recall the many accidents which have happened in the state and the number of lives lost by cross heads being used in shafts without any means of safety. Thomas Bryant of Butte has invented what is known as the "safety cross head" which has been tested and proven a success in every particular. The

first distinctive feature of this combination is the safety catch which grapples the guides and prevents the cross head from falling away. Another feature is a safety beneath which grapples the bucket in the event the rope should break. Everything works in uniformity holding the cross head and bucket safely in the shaft thus eliminating all danger in shaft sinking and operating in small mines where buckets are in use 300 feet and upward. The miners of this state should see that a law be enacted so as to compel their use in all shallow mines and in shaft sinking. The state too must realize that the miners, when underground, have rights of person which it is obliged to protect and it should give due regard to the safeguarding of the lives and persons of mine employees.

TO SAFEGUARD AGAINST ACCIDENTS.

We give a short chapter of don'ts. Don't roast your cartridges before a fire. Don't attempt to thaw them in any vessel without a water jacket. Don't put them on hot brick work. Don't put them in a stove oven. Don't thaw them in water when it is boiling. Don't store caps with the powder. Don't cut your fuse too short. Nippers made for the purpose are the best to use for securing the caps to fuse but in their absence the open end of the cap should be pressed tightly to the fuse with the blunt edge of a dull knife. Miners nearly always have a dull knife. In charging holes for blasting no iron or steel tool or rod should be used and no iron or steel should be used in any hole containing explosives. A charge which has missed fire should not be withdrawn but should be blasted and in case the missed hole has not been blasted at the end of a shift that fact should be reported to the foreman or shift boss in charge of the next relay of miners before work is commenced by them in that particular place.

You may have a missed shot. This may happen from defective fuse, from pulling the fuse out of the cap, from pulling both fuse and cap away from the primer or some other cause. If you have a missed shot never attempt to drill down to the charge but scrape out the tamping to within five or six inches of the powder, put in a short piece of cartridge and a fresh primer and fire it. This will explode the charge below. Always make your primers fresh as you want to use them. You will have less missed shots which will eliminate the danger to some extent.

No magazine for thawing powder, dynamite or other explosive should be erected or maintained at a nearer distance than four hundred feet from the mine and works, or any building, and every such magazine should be constructed of material and in a manner to insure safety against explosion from any cause and should be either so situated as to interpose a hill or rise of ground higher than the magazine between it and the mine and works or else an artificial mound of earth as high as the magazine and situated not more than 30 feet from it should be interposed.

No powder, dynamite or other explosive in excess of a supply for 24 hours should be stored under ground in a working mine. It should be kept in securely covered and locked boxes or in some other secure place. When thawed underground it should be kept in an unused part of the mine, never less than 50 feet from lines of underground traffic, nor less than 150 feet from places where drilling and blasting are carried on, and should at all times be in charge of a specified man, fully qualified by his experience to take charge of the same. No fuse, blasting caps, electric detonators or articles containing iron or steel should be stored in the same magazine with powder, dynamite or other explosive, or at a less distance than fifty feet from such magazine and they should be stored in a covered box in a place of safety. When a workman opens a box containing an explosive or in any manner handles the same he should not permit any lighted lamp or candle to come closer than five feet to such explosive nor permit the lamp or candle to be in such position that the air current may convey sparks to the explosive, and a workman with a lighted lamp, candle, pipe or any other thing containing fire should not be permitted nearer than five feet to an open box containing explosives.

A thorough daily inspection should be made of the condition of explosives in a mine and the superintendent or other officer in charge of a mine should institute an immediate investigation when an act of careless placing or handling of explosives is discovered by or reported to him and any employee who commits a careless act with an explosive or where explosives are stored or who, having discovered it, omits or neglects to report immediately such to officers in charge of the mine, should be discharged immediately.

A suitable house in which to thaw explosives should be built separate from the other mine buildings and should be equipped with apparatus for thawing explosives approved by the Inspector and should be under the direction of the mine foreman or some other careful and experienced workman. Whenever deemed necessary by the Inspector suitable apparatus for thawing explosives should be provided for use in the mine and should be used only under the direction of the mine foreman or some other careful workman. The quantity of explosives brought into the thawing house should not at any time exceed the requirements of the mine for a period of twenty-four hours, except where such requirements would be less than one hundred pounds.

Every underground plane on which persons travel or work such as chutes, man-ways and winzes, or any opening kept open for ventilation purposes or for the removal of ore or waste material should be protected by a guard rail or by a suitable cover known as a grizzley made of good substantial timbers with space enough to afford room for ore or other material to pass into the chutes. Shafts should be protected with guard rails on every level of the mine. In every man-way in a mine the ladder way should be placed in an inclined position commonly known to miners and safe landing at every 30 or 40 feet. A man hole to prevent miners from falling away in the event of a mishap. Every manway and air course used as an escape should be constantly kept-clear other than the protection at the entrance of such manway.

In reading over the list of accidents you will observe the necessity of such recommendations. Should they be enforced by a law being enacted governing such recommendations a great many lives will be saved in the future.

ACCIDENTS.

During the year 51 fatal accidents occurred. Forty-eight in Silver Bow county. All the other mining counties in the state three. While it is true the percentage of mine accidents in this state compares favorably with that of other states it is still too high. In reviewing the various causes of accidents there is attributed to falling in manways and ore chutes 17, which should not have occurred. Others have been by coming in contact with live wires which should have been covered or placed in such a position as to prevent men from coming in

contact with them. You will readily see from the recommendations why a law should be enacted governing all such dangerous practices. The miscellaneous accidents which go to make up the total can hardly be considered as properly coming under the head of preventable accidents.

The authority vested under the law stripped of its legal verbiage in the office of Inspector of Mines is that the Inspector is granted the right to inspect mines and is required to do so. Examine carefully the workings, timbering, ventilation, means of ingress and egress and investigate and inquire thoroughly into the means, methods and practices adopted and in force for the general preservation of the lives, safety and health of the miners employed and if the workings in any mine are found to be dangerous or insecure from any cause or a place is found to be poorly timbered or the machinery is found to be weak or the cable, bucket, skip, etc., discovered to be defective or that the lives and safety of the men are not considered. In the system adopted the Inspector or his deputy has the authority to serve a notice on the person in charge of such mine recommending that particular cause of danger be looked after and remedied without delay, and when this notice is served the full authority of the office, in so far as its ability to remedy bad mine conditions is concerned, is exhausted, as the law fails to make any provision for enforcing its recommendations, but such is the law. The miner must be killed or receive great bodily injury before any redress can be sought and an action for damages for loss of life and serious injury through mine accidents has not resulted so favorably to the plaintiffs as to cause any specific effort to be made to avoid their recurrence. It must not be understood from the comments made on the law in the foregoing that all of the mine owners and mine managers in the state are heartless and indifferent to the safety and welfare of their employees. On the contrary, there are, I am² pleased here to acknowledge, a very considerable number of them who are as solicitous³ for the safety, health and general welfare of their employees as the most exacting requirements would demand. They feel a personal responsibility for those under their charge and realize that their lives in a large measure are dependent on the precautionary measures adopted in their interest, especially in the position of underground foreman.

It is to this individual that the lives of the miners are entrusted. The proper method of timbering, keeping the work shaft in safe condition, the handling of explosives, the stoping ground are entirely under his supervision and the condition of the back at all times. It is sometimes true that the most watchful will fail to notice some feature of the workings in which death lurks. It is also true to a large extent that nearly all accidents in mines are due either to criminal negligence on the part of the officials or carelessness on the part of the miner. That both factors have been strong the past year is patent to any thinking individual. The former should be punished by the same method and to the same extent as any other crime equally disastrous to innocent persons and found guilty thereof. The fact that one mining company of the district has operated from two to three large properties for years and lost but a man or two and they through their own careless handling of explosives is sufficient evidence that other properties should be operated on the same basis or as nearly as possible. It can be done if the proper precautions are taken by the management. An earnest effort has been made by this Department to improve the methods of storing and thawing powder underground. Every wooden box and every apparatus constructed of wood in which heat was furnished by candle found doing duty as a thawing device was condemned in order to eliminate a certain element of danger.

During the years 1909 and 1910 Notices Recommending the following were issued and generally complied with:

1. In reference to timber and timbering..... 15
2. In reference to places for storing powder..... 10
3. In reference to quantity of explosives in magazines 12
4. In reference to storing inflammable materials in houses or buildings covering the mouths of tunnels 8
5. In reference to apparatus for thawing powder.. 9
6. In reference to employing cage tenders who should have exclusive charge of cages in shafts 7
7. In reference to defective safety clutches on cages 8
8. In reference to defective hoisting cables..... 5
9. In reference to escapement shafts..... 9

10. In reference to number of men who may ride on skips and cages	7
11. Forbidding riding on loaded cages, skips and buckets	12
12. In reference to the use of State Mining Signets	14
13. As to the use of gates when lowering and hoisting men	10
14. For providing better ventilation	20
15. As to providing tunnels with separate connections to the surface escapes	9
16. As to leaving pillars of ground to protect shafts	10
17. Regarding the rate of speed in lowering and hoisting	8
18. Regarding repairing and putting in ladders....	15
19. In reference to cross-heads	7
20. To provide railings around shafts, winzes and manways	19
21. In reference to finger boards	12
22. Regarding bulkheads, damming of water in mines	5
23. In reference to filling of stopes to prevent caves	12

During the year ending November 30th, 1909, there were:

Mines inspected	280
Men employed in mining	14,500
Fatal accidents	47
Percentage of fatal accidents to each 1,000 men employed	3 per cent
Non-fatal accidents	31
Percentage of non-fatal accidents to each 1,000 men employed	2 per cent

To the number of men employed as above, five hundred may be conservatively added which would include the scattered prospectors who are working their own claims and to cover those employed by the small operators, employing from two to five men and leasers making a grand total of 15,000 which were employed during the year.

Number and Causes of Accidents.

The following table shows the number of fatal accidents and their several causes occurring during the year ending November 30th, 1909.

Premature blast or explosion	7
Fall of rock or ground	14
Caught by cage in shaft	7
Falling down ore chute	7
Falling down manway	3
Suffocated by gas or foul air	2
By being pulled into shive wheel	1
By electric shock	1
By falling timber	5

Total fatal accidents for the year 47

Number and Causes of Non-fatal Accidents.

The following table shows the number of non-fatal accidents with their causes which occurred during the year ending November 20th, 1909:

Fall of rock or cave of ground	18
Premature blasts and explosions	2
Falling in ore chute	5
By falling timber	4
By coming in contact with car	1
By falling down manway	1

Total non-fatal accidents for the year 31

During the year ending November 30th, 1910, there were:

Mines inspected	280
Men employed	14,000
Fatal accidents	51
Percentage of fatal accidents to each 1000 men employed	3.6%
Non-fatal accidents	30
Percentage of non-fatal accidents to each 1000 men employed	2%

To the number of men employed we may conservatively add 500 who are prospecting and working their own claims and leasers making a grand total of men employed for the year of 14,500.

Number and Causes of Fatal Accidents.

The following table shows the number of fatal accidents and their several causes occurring during the year ending November 30th, 1910:

Premature blast or explosion	11
Fall of rock or ground	12
Caught by cage in shaft	5
Falling down ore chute	9
Falling down manway, shafts and raises	9
Suffocated by gas or foul air	3
By an electric shock	2
<hr/>	
Total fatal accidents for the year	51

Number and Causes of Non-fatal Accidents.

The following table shows the number of non-fatal accidents and their several causes occurring during the year ending November 30th, 1910:

Fall of rock or cave of ground	15
Premature blasts and explosions	6
Falling in ore chute	2
By falling timber	2
By coming in contact with cage	2
By falling down manways	1
Caught between cage and shaft	1
Defective engine	1
<hr/>	

Total number of non-fatal accidents 30

Mines Inspected, Men Employed, Accidents and Percentages.

The following table gives the number of mines inspected, the number of men employed and the fatal and non-fatal accidents in the metalliferous mines during the past eighteen years:

Years.	Mines Inspected.	Men Employed.	Fatal Accidents.	Non-Fatal Accidents.	Total Accidents.	Percentage of Fatal Accidents per 1000 Men.
1893	56	6,312	29	4	32	6.45
1894	73	7,082	27	19	46	6.81
1895	88	8,158	41	18	59	7.67
1896	73	7,727	64	21	85	10.23
1897	120	9,825	52	29	81	8.20
1898	136	11,096	48	29	77	6.97
1899	165	12,316	49	312	71	5.72
1900	163	13,996	47	35	82	5.86
1901	157	12,078	35	33	68	5.63
1902	169	13,784	47	45	92	6.68
1903	163	14,175	39	50	89	6.28
1904	176	14,480	41	55	96	6.63
1905	186	14,680	45	41	86	5.86
1906	190	15,000	52	43	95	6.33
1907	290	15,000	42	21	63	4.20
1908	280	14,500	21	17	38	2.62
1909	280	14,500	47	31	78	5.38
1910	280	14,000	51	30	81	5.79

To the men employed for 1910 may be added five hundred who are scattered over the state working their own prospects and those employed as leasers and employed in small mines making a grand total for the year of 14,500

FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1909.

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
July 18	Andrew Anderson...	Jefferson	Gold Flint	By falling down shaft 200 feet.
Oct. 28	A. L. Brookings....	Lewis and Clarke	Bald Mountain	Neck broken by falling in ore chute.
Oct. 14	Geo. Currie.....	Fergus	Barnes-King	Smothered by falling in ore chute.
Dec. 1	Fred Smith.....	Silver Bow	Black Rock	By piece of timber falling in shaft.
Dec. 9	Jos. Lumple.....	Silver Bow	Speculator	By fall of ground in stope.
Dec. 16	Wm. Harvey.....	Silver Bow	Bell	By suffocation.
Dec. 16	Walter Sweet.....	Silver Bow	Speculator	By falling of cage in shaft.
Dec. 17	Wm. Redman.....	Silver Bow	Never Sweat	By a fall of ground when shoveling.
Dec. 26	Fred Tweche.....	Silver Bow	Leonard	By a fall of ground in stope.
Jan. 5	Dan Sweeney.....	Silver Bow	Diamond	By fall of ground in stope.
Jan. 6	Jno. Martin.....	Silver Bow	Leonard	By a post slipping down timber slide.
Jan. 6	Hugh Carney.....	Silver Bow	Diamond	By falling off cage in shaft.
Jan. 19	Geo. Lazarsich....	Silver Bow	West Stewart	By fall of ground in stope.
Jan. 22	Pat Dyre.....	Silver Bow	High Ore	By fall of ground in stope.
March 3	Ole Espus.....	Silver Bow	Diamond	By premature blast in shaft.
March 3	Ed Spillman.....	Silver Bow	Diamond	By premature blast in shaft.
March 3	Louis Moe.....	Silver Bow	Diamond	By premature blast in shaft.
March 31	Jos. Wolden.....	Silver Bow	Diamond	By premature blast in shaft.
April 4	Jas. Pierce.....	Silver Bow	Mountain View	By falling off cage in shaft.
March 29	Stewin Murphy.....	Silver Bow	Parrot	By fall of ground.
March 29	Peter Jensen.....	Silver Bow	Leonard	By fall of ground in stope.
April 22	Rich. Slater.....	Silver Bow	Alex Scott	By fall of ground in drift.
May 24	P. Sullivan.....	Silver Bow	Mountain Con	By fall of ground in stope.
May 22	Geo. Sasso.....	Silver Bow	High Ore	By premature blast.
May 22	Frank Swyno.....	Silver Bow	High Ore	By premature blast.
June 18	Jos. Siro.....	Silver Bow	Moonlight	By cage being pulled into shive.
July 1	Jas Hughes.....	Silver Bow	Little Mina	By fall of ground.
July 13	Mike Gelevich.....	Silver Bow	Mountain Con	By falling down ore chute.
July 16	Martin Weston.....	Silver Bow	Tranway	By a descending cage in shaft.
July 22	Harry Nichols.....	Silver Bow	Mountain View	By a premature blast.
Aug. 10	Frank Raftery.....	Silver Bow	Mountain Con	By falling off cage in shaft.
Aug. 13	Jas. Goggins.....	Silver Bow	Black Rock	By falling off cage in shaft.
Aug. 19	Sam Ehl.....	Silver Bow	Leonard	By fall of ground in stope.
Aug. 30	Ed Hoski.....	Silver Bow	St. Lawrence	By a fall of ground.
Sept. 8	D. Harrington.....	Silver Bow	Anaconda	Struck by falling timber.
Sept. 14	Mike Donahue.....	Silver Bow	Speculator	Coming in contact with live wire.
Sept. 30	Wm. Cassidy.....	Silver Bow	St. Lawrence	By still slipping loose from rope.
Oct. 1	D. Sullivan.....	Silver Bow	Gagnon	By falling in ore chute.
Oct. 7	Mat Callo.....	Silver Bow	Diamond	By falling in ore chute.

FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1909—(Continued).

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
Oct. 7	Ole Eavenson	Silver Bow	Parrot	By fall of ground in stope.
Oct. 1	Harry Kitto	Silver Bow	Diamond	By fall of ground.
Oct. 23	Jos. Young	Silver Bow	Little Mina	By fall of ground.
Oct. 25	Pat Murphy	Silver Bow	Berkley	By falling down manway.
Oct. 25	Peter Gallagher	Silver Bow	Pittspon	By falling down ore chute.
Nov. 9	Jas. Harrington	Silver Bow	Speculator	By falling down ore chute.
Nov. 11	Mike Lowney	Silver Bow	Leonard	By falling through floor in stope.
Nov. 21	Jas. McAndrews	Silver Bow	Pennsylvania	Being struck by machine drill.
Nov. 27	Frank Rooney	Silver Bow	Tramway	By premature blast in drift.
Nov. 30	Pat Brown	Silver Bow	Tramway	By premature blast in drift.

NON-FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1909.

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
June 12	John Mungall	Fergus	Barnes-King	By fall of ground in stone. Leg broken.
July 16	Jack Hunter	Madison	New Mine	Injured by premature blast. Loss of one eye.
Dec. 11	Mike Connell	Silver Bow	East Gray Rock	Leg broken by fall of ground.
Dec. 12	Jos. Kirlieith	Silver Bow	Mountain View	Injured by falling in chute.
Dec. 22	Con. Murphy	Silver Bow	St. Lawrence	Injured by fall of ground.
Dec. 23	Eugene Rust	Silver Bow	Mountain View	Injured by fall of ground.
Jan. 1	Jas. Casey	Silver Bow	Buffalo	Injured while freeing chute.
Jan. 7	Ed Doran	Silver Bow	East Gray Rock	Leg broken by falling timber.
Jan. 3	Geo. Broderick	Silver Bow	Speculator	Injured by premature blast.
Jan. 20	Chas. Moyle	Silver Bow	High Ore	Leg broken by fall of ground.
Jan. 26	Geo. Moore	Silver Bow	Leonard	Leg broken by fall of ground.
Jan. 26	Thos. Welch	Silver Bow	Newer Sweat	Injured by falling down raise.
Feb. 24	Peter Ritter	Silver Bow	Mountain Con	Leg broken by fall of ground.
March 14	Jas. Brogan	Silver Bow	West Stewart	Leg broken by fall of ground.
April 14	Clinton	Silver Bow	Parrot	Leg broken by fall of ground.
April 15	McIlree			
April 15	Jas. Burke	Silver Bow	Silver Bow	Injured by falling down chute.
April 19	Isadore Igerban	Silver Bow	Diamond	Injured by falling down chute.
April 19	Julius Steinman	Silver Bow	Speculator	Leg broken by fall of ground.
April 25	E. Sullivan	Silver Bow	Mountain Con	Leg broken by fall of ground.
May 21	M. Gallagher	Silver Bow	Mountain Con	Injured while putting in timbers.
June 1	Jas. Crowley	Silver Bow	St. Lawrence	Leg broken by falling timber.
Aug. 11	J. Connors	Silver Bow	Parrot	Injured by falling in ore chute.
Sept. 18	Geo. Holland	Silver Bow	Anacoda	Leg broken in fall of ground.
Sept. 21	Geo. Martin	Silver Bow	High Ore	Leg broken by car turning over.
Sept. 25	Geo. Darnell	Silver Bow	Mountain View	Injured by fall of ground.
Oct. 10	Geo. Brown	Silver Bow	Speculator	Leg broken by fall of ground.
Oct. 22	Ed. Richards	Silver Bow	Pennsylvania	Leg broken by fall of timber.
Oct. 21	Geo. Gaudsen	Silver Bow	Original	Leg broken by fall of ground.
Oct. 25	Louis Knoke	Silver Bow	Mountain Con	Injured by fall of ground.
Nov. 20	Chris Martin	Silver Bow	Gagnon	Leg broken by fall of ground.

FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1910.

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
Jan. 8	Wm. Hackman	Jefferson	Minnesota	By falling down shaft working around pump.
March 8	Fred Pucci	Broadwater	Keating	Struck by cage in shaft.
Dec. 13	Robt. Freely	Silver Bow	Gagnon	Killed by fall of ground in stope.
Dec. 13	Jno. Gardsen	Silver Bow	Original	By fall of ground in shaft.
Dec. 12	Michael Muirvell	Silver Bow	Balakava	Struck with cage in shaft.
Dec. 25	Tom Johnston	Silver Bow	Speculator	Falling in manway.
Dec. 28	Mike Lyons	Silver Bow	Anaconda	Falling down raise.
Jan. 20	Nick Daub	Silver Bow	East Butte	Falling down shaft.
Jan. 28	Costa Bellieu	Silver Bow	East Butte	Falling down manway.
Feb. 9	Chris Asek	Silver Bow	St. Lawrence	Struck by piece of pipe.
Feb. 28	Edw. Toma	Silver Bow	East Butte	Falling in ore chute.
March 11	Jno. Martin	Silver Bow	Raven	Fell from bucket while being lowered down shaft.
March 12	Tony Trolev	Silver Bow	Tramway	Fall of ground.
March 18	Peter Dellaagua	Silver Bow	Tycone	Falling down manway in shaft.
March 24	Sam'l. Rodvich	Silver Bow	Tramway	Fall of ground.
April 18	Mike Joy	Silver Bow	Diamond	By falling drills while descending shaft.
April 20	Geo. Durkin	Silver Bow	Badger	Struck by sinking bucket in shaft.
May 5	Jno. Feel	Silver Bow	Gagnon	Trying to step on moving cage in shaft.
May 19	Dennis McKagru	Silver Bow	Speculator	Falling down raise in stope.
June 1	John Nile	Silver Bow	St. Lawrence	Falling in ore chute.
June 1	Jno. Sweeney	Silver Bow	East Gray Rock	Killed while attempting to free ore chute.
June 10	John Kolwa	Silver Bow	Speculator	Premature blast.
June 12	Jno. Gayser	Silver Bow	Pennsylvania	By fall of ground.
July 2	Dan McCollan	Silver Bow	Tramway	Fell in ore chute.
July 6	Richard Matthews	Silver Bow	Speculator	Fall of ground.
July 11	Henry Johnston	Silver Bow	St. Lawrence	Fall of ground.
July 14	Thos. Goodman	Silver Bow	Gagnon	By ascending cage in shaft.
July 23	Mike Ryan	Silver Bow	Anaconda	By fall of ground.
July 27	Jno. Rodgers	Silver Bow	St. Lawrence	Premature blast.
July 27	Frank Bruncau	Silver Bow	St. Lawrence	Premature blast.
Aug. 5	Thos. Gallagher	Silver Bow	High Ore	Fall of ground.
Aug. 12	P. Grachino	Silver Bow	West Colusa	Falling in ore chute.
Aug. 17	Jno. Laki	Silver Bow	St. Lawrence	Falling in ore chute.
Aug. 18	Sam Kunzrig	Silver Bow	Speculator	Smothered when freeing ore chute.
Aug. 26	Wm. Thomas	Silver Bow	Mountain View	Falling down raise.
Aug. 21	Jno. Venetta	Silver Bow	West Stewart	Falling in ore chute.
Aug. 29	Jno. Counsins	Silver Bow	Anaconda	By fall of ground.
Sept. 9	Thos. Nivas	Silver Bow	Leonard	Fell in manway.

FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1910—(Continued).

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
Sept. 12	Antona Desjardis ..	Silver Bow	Mountain View	Came in contact with live wire.
Oct. 1	Jas. McDowell	Silver Bow	Leonard	Premature blast.
Oct. 12	Jno. Lund	Silver Bow	Leonard	Premature blast.
Oct. 12	Wm. Mellon	Silver Bow	Leonard	By heart failure under ground.
Oct. 20	Chas. Pakkarie	Silver Bow	Speculator	By fall of ground.
Nov. 1	Gus Backlund	Silver Bow	Leonard	By premature blast.
Nov. 1	Oscar Maki	Silver Bow	Leonard	By premature blast.
Nov. 1	John Lilrose	Silver Bow	Leonard	By premature blast.
Nov. 1	Elias Skari	Silver Bow	Anaronda	Killed by falling down shaft.
Nov. 8	Chas. Koklos	Silver Bow	Rena	Suffocated by gas and powder smoke in shaft.
Nov. 11	Bert Rearden	Broadwater	Rena	Suffocated by gas and powder smoke in shaft.
Nov. 11	Eugene Parr	Broadwater	Clear Grit	By a fall of ground.
Nov. 20	Andrew Curry	Silver Bow	Clear Grit	By a fall of ground.

NON-FATAL ACCIDENTS, THEIR NATURE AND WHEN OCCURRING FOR THE YEAR 1910.

DATE.	NAME.	COUNTY.	MINE.	CAUSE.
June 24	Geo. Koontze	Broadwater	Keating	Premature blast in stope.
Dec. 7	Jerry Neely	Silver Bow	Anaconda	By a fall of ground.
Dec. 12	Simon Kirshy	Silver Bow	Anaconda	Leg broken by fall of ground.
Jan. 28	Wm. Morrow	Silver Bow	Speculator	Back injured by fall of ground.
Jan. 29	Jerry Donahue	Silver Bow	Anaconda	Leg broken by fall of ground.
Feb. 10	E. T. Carlson	Silver Bow	Speculator	Leg broken by fall of rock.
Feb. 15	Michael Divilish	Silver Bow	Anaconda	Leg broken by falling timber.
March 7	Mike Manning	Silver Bow	Anaconda	Arm injured by fall of ground.
April 13	Fred Waro	Silver Bow	Anaconda	Injured internally by falling in ore chute.
May 11	Archy McMullen	Silver Bow	Buffalo	Injured by one car; flesh wound.
May 11	Pat Dalley	Silver Bow	Tramway	Legs injured by fall of ground.
May 5	R. E. Bell	Silver Bow	Mountain Con	Eyes injured by premature blast.
June 22	J. Thompson	Silver Bow	Leonard	Leg broken by fall of ground.
June 23	Henry Johnston	Silver Bow	Leonard	Leg broken by fall of ground.
June 28	Jno. Sullivan	Silver Bow	St. Lawrence	Hands injured by blasting boulders.
July 6	Jno. Savage	Silver Bow	Gagnon	Head badly injured by falling in chute.
July 29	Peter Farrell	Silver Bow	East Gray Rock	Back injured by falling down manway.
Aug. 12	Jas. Dumbley	Silver Bow	Diamond	Leg broken by car.
Aug. 21	Dan Neary	Silver Bow	Colorado	Leg injured by defective engine.
Aug. 29	M. Donahue	Silver Bow	Never Sweat	Leg broken by fall of ground.
Sept. 1	Jno. Lungan	Silver Bow	Bell	Leg broken by fall of ground.
Sept. 4	Louis Erickson	Silver Bow	J. I. C.	Arm injured between cage and shaft.
Sept. 29	Rich. Northy	Silver Bow	Speculator	Injured by premature blast.
Oct. 14	Peter O'Mara	Silver Bow	Speculator	Injured by premature blast.
Oct. 25	Con. Cotter	Silver Bow	Speculator	Fall of rock.
Oct. 25	Wm. Burnes	Silver Bow	Leonard	Fall of ground.
Oct. 25	Thos. Bell	Silver Bow	Leonard	Fall of ground.
Nov. 4	Patrick Connel	Silver Bow	Mountain View	Fall of ground.
Nov. 4	Wm. Mason	Silver Bow	Original	Premature blast.
Nov. 4		Silver Bow	Original	Premature blast.

**PRODUCTION OF SILVER, COPPER, LEAD AND GOLD IN MONTANA
BY COUNTIES—1908.**

Counties.	Gold.	Silver.	Copper.	Lead.	Zinc.
Beaverhead	\$ 6,790	\$ 20,646	\$ 17,144	\$ 3,386	....
Broadwater	140,822	13,516	110,062	12,016	....
Cascade	4,688	49,831	838	175,400	....
Chouteau and Flathead ...	273,263	12,025	500	....	....
Deer Lodge	68,453	20,170	9,285	12,318	....
Fergus	761,096	5,710	....	....	....
Granite	93,041	238,536	9,810	5,983	....
Jefferson	139,053	554,993	44,650	73,393	....
Lewis and Clark	218,664	57,304	2,991	51,970	....
Madison	587,582	18,585	2,807	8,006	....
Meagher, Carbon, Park and Ravalli	76,000	1,200	5,000	....	....
Missoula and Sanders	30,973	43	622	....	....
Powell	45,521	133	6,401	5,068	....
Silver Bow	661,610	4,505,386	33,019,894	25,108	77,089

MONTANA'S MINERAL OUTPUT.

Year.	Gold.	Silver.	Copper.	Lead.	Total.
1890	\$3,300,000	\$20,363,636	\$16,665,437	\$ 675,392	\$40,095,465
1891	2,890,000	20,139,394	14,377,336	1,229,027	38,635,757
1892	2,891,336	22,432,323	19,105,464	990,035	45,419,208
1893	3,576,000	21,858,780	16,630,958	964,089	43,020,827
1894	3,651,410	16,575,458	17,233,718	730,551	38,191,137
1895	4,327,040	22,886,992	21,114,869	754,360	49,083,261
1896	4,380,671	20,324,877	25,356,541	670,010	50,732,099
1897	4,496,431	21,730,710	26,798,915	928,619	53,954,675
1898	5,247,913	19,159,482	26,102,616	809,056	51,310,067
1899	4,819,157	21,786,835	40,941,906	909,340	68,457,338
1900	4,736,225	18,334,443	39,827,135	701,156	63,746,727
1901	4,802,717	18,334,443	36,751,837	498,622	60,387,619
1902	4,400,095	17,622,285	24,606,038	332,749	46,961,167
1903	3,590,516	17,097,702	28,200,692	387,445	50,276,335
1904	5,097,786	18,887,227	36,410,301	195,525	60,590,848
1905	4,889,234	7,991,705	48,165,277	227,160	70,677,583
1906	4,469,014	8,027,027	56,105,288	254,390	68,855,764
1907	3,286,212	6,149,619	57,945,000	275,500	67,646,330
1908	3,057,640	5,488,785	45,195,000	265,400	54,006,820

MINERAL OUTPUT OF THE UNITED STATES.

As nearly as can be estimated the mineral and metal production of the United States for 1909 was valued at \$2,087,-119,999. There are a number of mines, figures of the products of which were not completed but we believe that our estimate will be found not far from the final returns. An idea of the magnitude and growth of the mineral industry in the United States may be had by pursuing the accompanying table which gives the values of the production for the years 1883 to 1908 inclusive.

Year.	Total Production.	Annual Increase.	Annual Decrease.	Percent.
1883	\$ 446,859,472	\$	\$ 5,041,686	1.1
1884	406,110,405		40,749,068	9.1
1885	418,803,180	12,692,775		3.1
1886	433,137,994	15,334,804		3.7
1887	508,387,674	74,249,680		17.1
1888	524,624,536	16,236,862		3.2
1889	531,392,513	6,767,977		1.3
1890	606,476,380	75,083,867		14.1
1891	605,385,029		1,091,361	.2
1892	622,543,381	17,158,352		2.8
1893	543,693,967		78,849,414	12.7
1894	549,374,763	5,680,800		1.1
1895	640,771,528	91,396,769		16.6
1896	640,544,221		227,307	.1
1897	646,992,582	6,448,361		1.0
1898	724,278,854	77,286,272		11.9
1899	1,014,355,705	209,076,851		40.1
1900	1,107,020,352	92,664,647		9.1
1901	1,142,000,029	34,979,677		3.1
1902	1,323,102,717	181,102,688		15.9
1903	1,491,928,980	118,826,263		12.8
1904	1,361,067,554		130,861,426	8.8
1905	1,623,928,720	262,861,166		19.3
1906	1,902,517,565	278,588,845		17.1
1907	2,087,119,999	184,602,434		9.7
1908	2,052,187,879	173,403,334		12.7

It is worthy of remark that the mineral output of this country has been multiplied nearly five times during the last twenty-five years. To-day America produces in values, nearly four times more in minerals than Great Britain. In 1907 the United States lead the world in the production of coal, copper, lead, petroleum, natural gas, pig iron and many minor metals and minerals and was second in gold output to the Transval and second in silver to Mexico. Reviewing the mining industry we find that no other country has equalled the creditable record that has been maintained by Montana during the last quarter of a century.

MINE PRODUCTION OF GOLD, SILVER AND ASSOCIATED METALS IN MONTANA IN 1907, AND 1908.

Metals.	1907 Quantity.	1907 Value.	1908 Quantity.	1908 Value.	Quantity.	Value.
Gold, fine ounces	158,970.51	\$3,286,212	147,912.33	\$ 3,057,640	—	—
Silver, fine ounces	9,317,605	6,149,619	10,356,199	5,488,785	+ 11,057,17	\$ 228,572
Copper, pounds	229,108,792	44,021,758	251,667,795	33,220,149	+ 1,038,591	—
Lead, pounds	3,748,304	198,660	4,596,570	193,056	+ 31,559,003	—
Zinc, pounds	243,100	14,343	1,640,000	77,080	+ 818,266	—
		\$53,670,592		\$12,036,710	+ 1,396,900	\$ 5,604
					—	+ 62,737
						\$11,633,882

+ Increase.

— Decrease.

PLACER MINING.

It is difficult to obtain an accurate statement of the gross product of gold for the state for any particular year or period of years owing to the many ways in which it is obtained in its nature and the different methods in which it is disposed of. The placer yield of the state since the discoveries of 1862 have run into the millions, much of which drifted into channels that financially found use for it without credit having been given to the placer miner. In this state during 1909 and 1910 especially in the vicinity of Virginia City, Madison County, several new discoveries have been made and three new electric dredges have been placed in operation for the recovery of the values contained in the gravel of the district.

In Lewis and Clark county several gravel beds are in operation employing the system of sluicing. The gravel beds of Ten Mile have been bonded to Eastern capitalists and several tests have been made with the view to installing dredges. In the operation six hundred acres have been secured by the company. The French Bar company operating in Missoula county on the head of Cedar Creek has built one of the largest gold dredges in the state doing away with the sluicing system and effecting greater saving of the fine gold contained in the gravel. The Cherry Creek Placer Mining Company in the Snow Shoe District in Lincoln county has begun operations. The company owns about one thousand acres of placer ground and has practically an unlimited quantity of gravel which runs very high to the yard in gold. There were three hydraulic plants in operation in the Libby district during the year and others are in contemplation. The Allen Gold Mining company is operating two placer mines in Deer Lodge county, one property is operated by means of a steam derrick with hydraulic mining and sluicing using hydraulic pressure in operating. The properties have been worked extensively and the returns have been exceedingly large. There are many known rich deposits of placer gravel within the state that are dry and so situated that water cannot be taken to them without great expense and these are lying idle waiting the perfection of a practical machine that will extract both the fine and coarse gold with certain and ample profit to the owners.

BROADWATER COUNTY.

The most active district was Radersburg several new companies being launched and are all active in the development of the camp. The majority of them having encountered shipping ore containing gold values. One of the principal properties is the Keating which has attained a depth of 700 feet. An electric power line has been erected from Boulder to the camp a distance of fifteen miles which was financed by the Keating Gold Mining company. Power will be furnished to all operating companies in the district.

The V Dandy Group.

This group of claims is situated in the Winston district and has been developed very extensively during the year for the purpose of determining the extent of the ore body the property having been opened by several tunnels driven for exploring purposes, 600 feet having been accomplished.

The property is owned by C. H. Clark of St. Louis, Peter Reess is the superintendent and eight men are employed.

The Aquafreo Mines.

This group of mines has been in operation during the year by C. H. Muffley the property being developed by an incline shaft which has been put down to a depth of 250 feet on the vein which has been developed East and West. A length of 300 feet showing a well defined ore body, the values being gold. Operations are conducted in a safe manner. Twenty-five men are employed.

Black Bird.

This property is located in Magpie Gulch. It has been operated under a lease by G. H. Donaldson & Company. The property has been operated through a tunnel which has reached a length of 800 feet, the principal part of the work being confined to the extraction of ore which runs very high in gold value. Regular shipments have been made. Six men are employed.

The McCartzincker Mining Company.

This mine is located five miles South of Winston. A shaft has been sunk to a depth of 100 feet in the vein. A drift has been driven East on the vein a length of 100 feet showing a well defined ore body. The plant has been equipped with a horse whim for the present. Regular shipments of ore have

been made containing silver, lead values. The company employs eight men.

Ohio Keating.

The property owned and operated by the Ohio Keating Gold Mining Company is situated West of the Keating mine. Some very extensive improvements have been made during the year. A steam plant and a compressor have been installed of sufficient power to attain a depth of 500 feet. The shaft was repaired and sunk to a depth of 200 feet and the vein cut which has been developed a distance of 200 feet showing a well defined vein carrying gold values. The property has been under the management of Bert Mitchell employing fifteen men.

Eclipse Mine.

The Eclipse Group of claims is located in Ironage Gulch south of Winston and has been developed very extensively during the year by C. H. Muffley who has acquired a lease on the property. Operations are conducted by an incline shaft having a depth of 200 feet. The vein has been opened a distance of 600 feet and some very high grade ore has been extracted carrying as much as \$100 dollars to a ton. The veins in the district are very flat almost in blanket form. The property is under the supervision of Emery Cupples there being fifteen men employed.

The Mary Etta.

The Mary Etta mine being situated in the Park Mining District operations have been conducted through a series of tunnels the longest having reached a length of 900 feet, this being the lowest in the mountain. Connections made with the upper tunnel afford ventilation and exit to surface. The property having been worked under the leasing system to a party of men under the supervision of Jerry Leary, employs fifteen men in the extraction of ore which has been recently uncovered. Development has been carried on very extensively during the year. 500 feet being accomplished. The property is in a fairly safe condition.

The Hard Cash Mines.

This group consists of six claims situated four miles West of Radersburg and is owned by the Hard Cash Mining Company of which A. M. Easterly is the General Manager. The properties are operated by a series of tunnels 500 and 700 feet

respectively both of which are driven on the vein and connections for air and exit with upraises. The property has undergone a vast amount of repair work and exploration during the year uncovering several ore bodies of a shipping character, the values being silver and lead.

The Keating Gold Mining Company.

The Keating Gold Mining company is operating the Keating and Blacker properties situated in the Radersburg district under the supervision of Richard Hightower the property being developed through two shafts 700 and 400 feet respectively, the 700 being an incline which has been equipped with electric power throughout, the power being installed during the year. It is furnished by the Missouri River Power Company. The power exacts a great saving in the operation of the property. The plant is equipped with all safety appliances, a skip being used in the operation. The mine is thoroughly ventilated and the necessary escapes to the surface have been put through. The property has been extensively developed during the year, 2000 feet having been accomplished there being 100 men employed.

The Black Friday.

The Black Friday group located South West of Radersburg and operated by the Black Friday Gold Mining Company under the management of John Sucetti employing 35 men on the property. The property has been extensively developed during the year, the shaft having been extended to a depth of 500 feet, 200 feet being added during the year. An entire new plant has been installed consisting of a skip with all safety appliances attached, a compressor and hoist of the legerwood make, making an up to date plant throughout. The vein has been developed very extensively some 1400 feet showing a well defined vein and a continuous ore body which has shown permanency with depth carrying gold values.

The Etta Mine.

The Etta property has been operated by the Rena Mining Company of Chas. Muffley who is manager and Enoch Norma the foreman. The property has been developed by an incline shaft having reached a depth of 300 feet, 100 feet having been added during the year. The shaft cut the 1000 foot tunnel at

a depth of 200 feet from the surface furnishing ample ventilation and means of escape.

The company employs twelve men.

The John L. Mine.

The property known as the John L., is situated at Hassel and operations are conducted through a series of tunnels they having been driven to a length of 500 and 700 feet respectively on the vein. The vein is a true, persistent fissure. The gangue is an altered granite carrying a sulphide in character, containing silver, lead and copper. A tunnel is in contemplation to tap the vein at a much greater depth. The greater portion of the vein being of a concentrating character. The property is owned and operated by M. J. Cavanaugh and Company.

The Argo Mine.

The Argo Mine is operated by the Eclipse Mining company and was in constant operation during the year 1909. Operation has ceased during this year. The property is situated in the Hell Gate mining district, twelve miles East of Canyon Ferry. The property is operated through a series of tunnels comprising 800 and 600 feet respectively. A winze has been put down from the lowest tunnel leaving a depth of about 100 feet. Explorations have been carried on to determine the extent of the ore body. The high grade ore is shipped to the smelter direct from the mine and the lower grades are treated in the 40 ton concentrator at the mine. The values are copper and the ore is concentrated three into one which makes a very high grade ore. The ventilation of the mine is very good. The mine is in good shape throughout. The workings are well connected with raises to the surface. Sixty-five men were employed before operations ceased.

The Rena Mine.

The Rena property is operated by the Radersburg Rena Mining company of which Chas. Muffley is the manager and Enoch Norem, foreman. An incline shaft was put down on the property to a depth of 250 feet of which 200 feet was accomplished during the year. The vein has been drifted on East and West. The ore secured is an iron oxide carrying good values in gold and copper. Shipments of ore are being regularly made. The equipments consist of a steam hoist of sufficient power to attain a depth of 500 feet. Twelve men are employed.

Silver Wave Mine.

This property has been taken over by the Ruby Gulch Gold Mining Company and has been put in shape for future development. Machinery has been installed consisting of a boiler and hoist of sufficient capacity to attain a depth of 400 feet, the shaft being 300 feet at the present time. The development consists of driving on the vein and the extraction of ore, the character being silver, lead, which contains very high grade values in gold. Connection has been made to the surface for ventilation and escape. There are twenty-five men employed by the company under the management of John Powers.

Little Joint Group.

This group has been developed by J. Edwards and the Whitehead Brothers. It is being developed by tunnels ranging in length from 200 to 500 feet which have all indications of a very promising property. The principal value contained is gold. The vein has been developed to a distance of 400 feet showing a well developed mineralized zone. There are 8 men employed.

BEAVERHEAD COUNTY.

The mineral resources of this county are extensive in area, the mineral zone lying on both sides of the Big Hole River. The different districts have had a good deal of superficial development. Enough to demonstrate the fact that complete and deep development is fully warranted. The principal districts are Blue Wing, Bannock and Elkhorn. In all of which ore has been discovered in paying quantities.

Most of the veins that have been explored to any extent are contacts between lime and granite and usually extend a great distance on the strike carrying good values usually in gold, silver and copper. The principal mining districts in the county have been inactive owing to the low price of the various metals contained in the ores, the most active being the Dark Horse mine owned by the Calumet and Montana mining company. The company has under construction a tunnel to be driven through the divide from the Montana side to connect on the Idaho side so as to procure transportation on the railroad which has been built through the district. The tunnel when completed will be 5,000 feet in length, 1000 feet having been accomplished during the year. In the various other districts mining has been carried on by the leasers. Some

very high grade ore has been shipped from the various districts.

CASCADE COUNTY.

Because of the low prices of silver and other metals the progress and development of Neihart and vicinity has been checked. Several mines are still in operation however but the work is confined to the extraction of ores opened up in the past. In the Benton District the Ripple Mining Company has been a steady producer. In the Johannesburg district extensive development has been conducted and much new work has been done. Several new and promising strikes have been made on the divide between Cascade and Meagher counties showing copper.

Snow Drift Group.

The Snow Drift Group of claims situated in the Snow Shoe district is being operated through a series of tunnels ranging in length from 250 to 900 feet respectively. Connections are made between the various levels to surface which furnished ample ventilation and escape. In case of necessity, several short crosscut tunnels tap the vein at various depths and several chutes of extremely rich ore have been encountered. The property is under the management of Daniel Lemy, employing eight men.

The Ripple Group.

The Ripple mine is another property which has produced a fair tonnage of high grade ore of silver and gold. During the past two years a tunnel has been driven lower down the mountain which has encountered the vein 200 feet lower than the recent workings. Connections are made to the surface for escape and ventilation. The property was developed under J. C. C. Barker employing 16 men. Because of the gold values contained this property is considered one of the most likely in the district.

The Lexington Mine.

This property is located on the West end of the Big Seven and is operated by a party of leasers and regular shipments to the silver smelter are made. Prospecting and developing are carried on extensively to ascertain the extent of the ore bodies. The property is owned by the Pearson and Harrison Company.

The Black Diamond.

This property belongs to the Black Diamond mining company and is situated on Snow Shoe Creek seven miles North of Neihart. The mining operations are through a tunnel that has been extended into the mountain eleven hundred feet cutting several veins of concentrating ore of silver and lead character. A fifty ton concentrator has been erected for the reduction of the mine output. The mine has been extensively developed on the vein. The operations are under the supervision of Paul Roehl.

The Fitzpatrick Mine.

This property is situated East of Neihart and operations are carried on through a tunnel that has reached a length of 750 feet. 450 feet have been driven on the vein East and West showing an extensive ore body of silver character. The property is owned by Robert Ford. All necessary escapes and exits to the surface have been provided.

The Marguerite Mine.

This property is located two miles North of Neihart and is operated through a tunnel that has reached a length of 300 feet on the vein and several shipments of ore have been made. A second tunnel is in course of construction to cut the vein at a greater depth. The ore is a lead silver in character which runs very high in silver. The property is owned by Frank Linquist, who is manager.

The Barker Mine.

This property has not been operated since 1902 until recently. Now operations are conducted by the Barker Mining Company of which Mr. Gunn is the General Manager and Henry Tegtmire the Superintendent. Thirty-five men are employed in its operation. A vast amount of exploring has been done during the year. Eight hundred feet has been accomplished, the shaft being sunk to the 400-foot level. Equipped with a steam hoist of the Griffith and Wedge make cages are used in the operation, with all safety appliances attached. The vein has been developed several hundred feet showing some very extensive ore bodies carrying lead, silver and copper values. A concentrator is in course of construction for the reduction of the output. There are 35 men employed under the supervision of Henry Tegtmier.

Big Seven Mine.

The Big Seven has been operated during the past years by leasers. The ores contain a liberal percentage of gold. New development was undertaken by the Company during the present year. A tunnel is in course of construction which will cut the vein 700-feet below the deepest working. Five hundred and five feet having been accomplished during the year. Machine drills are used in the operation. Twelve men are employed under David Barker, Superintendent.

Benton Group.

The Galt mine and the Benton Group were in the hands of leasers. Altogether the respective veins are divided into sections and these sections leased to parties of from two to four men. Through this system quite a tonnage of ore has been taken from these properties which otherwise would not have been obtained.

The Johannesburg Group.

This group of seven patented claims is operated by the Johannesburg Gold Mining Company of which A. Nelson is the Superintendent. Extensive development is being done. The shaft has been put down to the 500 foot level. The vein has been extensively developed on the three hundred foot-level showing some very extensive ore bodies of a concentrating character. The values are principally gold. The five hundred foot level will be explored to determine the continuity of the ore bodies. The property is equipped with boilers and a Ledgerwood hoist of sufficient power for the present depth. The company is employing 20 men.

CHOUTEAU COUNTY.

Mining has gone steadily forward. New discoveries have been made and new companies launched for the development of the several important districts. The new ventures will in time be the equals of mines now producing in the district. The portion of the country embracing Peoples Creek and Landusky has been active during the year. Several promising prospects have been opened up. The August Group has been put in shape to produce ample tonnage for the increased mill capacity.

The Rawhide Mine.

This property is located on the extension of the Alder Gulch property to the east. A tunnel 400 feet in length has been

driven on the vein some of the ore being of sufficiently high grade and has been shipped. The property has been developed extensively on the vein to ascertain the continuity of the ore bodies which are of a cyaniding character. The formation is lime and porphyry.

The August Gold Mining Company.

This group consists of eleven claims situated at Landusky, the property being developed through a series of tunnels ranging in length from 200 feet to 700 respectively. Connections are made between the various tunnels to the surface for ventilation and escape. There are fifty men employed. The ore is reduced in the plant which is located below the mine, it having a capacity of 125 tons per day. Development work has been going on in several of the claims during the year; 3,000 feet has been accomplished. The ore is of a cyaniding character, the value being principally gold. The property has been under the supervision of D. A. McCandless.

The 96 Mine.

This property is situated on Dry Beaver three miles north of the Alder Gulch mines and is owned by the Beaver Creek Mining Company. E. E. Berry, the superintendent, employs nine men. The property is opened by a series of tunnels ranging in length from 200 to 700 feet respectively. The most part being done for development on the vein showing some very extensive ore bodies of a cyaniding character carrying gold.

The Fergus Mining Company.

This company's property comprises a group of thirteen claims situated on the north side of the Little Rockies on Peoples Creek. Operations are conducted by tunneling, several tunnels having been driven a distance of 400 feet and large ore bodies have been encountered which have been tested and found to be of a cyanide character. The property has been extensively developed during the year. Five hundred feet has been accomplished. The property is under the supervision of J. W. Williams, employing seven men.

The Ruby Gulch Mining Company.

The Ruby Gulch properties are situated at Zortman and consist of a group of seventeen claims. The property has undergone a vast amount of improvement during the year. A tunnel has been driven from the Independence claim to

connect with the Ruby which will tap the ore body 200 feet below the lowest workings. The ore is run by an electric tram to the mill which is on the same level, which will greatly reduce the cost of transportation also being very beneficial for ventilation purposes. The development of the mine is kept well ahead of the stoping. The entire plant is electrically driven. The mine is in a condition to increase its output one third, the mill having a capacity of 300 tons per day. The property has been under the supervision of Frank Schultze during the year. It employs 150 men.

DEER LODGE COUNTY.

Mining has been active and development gives evidence of some extensive mineral leads with every indication of permanency as far north as the Red Lion District, where some very high grade ore has been discovered and extensive exploration has been done. Cable, Southern Cross and Georgetown flats are the principal districts so far as developments show. The Southern Cross Mine has been extensively developed and large bodies explored. In the French Gulch Mining District development has been carried on and several veins have been opened up with all indications of developing in merchantable ore bodies. The veins are true fissures in granite.

The Spain Mine.

This group of claims is situated in the French Gulch Mining District and is owned by the Allen Gold Mining Company. Two of the claims have been developed extensively during the year, the Spain and McKinley. The shaft on the McKinley has reached a depth of 100 feet and driven to intersect the vein at that depth. The shaft on the Spain is sunk to a depth of 200 feet and 1,300 feet of developing has been accomplished showing a well defined vein carrying gold, silver and lead. The veins are well defined fissures in granite formation. A tunnel has been extended to a length of 700 feet. An exit has been raised from the lowest working to the tunnel level for ventilation and escape in case of accident. The property is under the management of W. R. Allen. It employs 30 men in the development. The equipment consists of a steam hoist and compressor with all safety appliances attached.

The Fothringuy Mine.

This property is owned by the Gold Coin Mining Company and is under the supervision of L. F. Ireland. Operations are carried on through tunnels that have been driven into the mountain to intersect the vein at a distance of 200 feet which was accomplished during the year. The vein carries free gold. It has been opened to the extent of a hundred feet east where ore extraction has been carried on. The work has been properly timbered as far as developed.

The Cable Mine.

The Cable mine is located sixteen miles west of Anaconda on what is known as Cable mountain and operated by the Cable Consolidated Mining Company of which H. C. Bacorn is superintendent. The main work tunnel is 2500 feet in length. In the aggregate there has been 3500 feet of developing accomplished. The work at present consists of exploring the different claims for the purpose of locating the different ore bodies existing in the properties.

The Venezewela Mine.

The Venezewela property is being developed by George Masten by an incline shaft 100 feet in depth developing the vein at that depth to the extent of fifty feet has been accomplished where some very high grade ore has been uncovered. There are seven men employed.

The Oro Fino Mine.

The Oro Fino Mine is situated in the Georgetown district and is owned by Charles Bostrom and Company. A perpendicular shaft has been sunk to a depth of 300 feet exploring the ore body at that depth which is very extensive. Connections have been made to the surface by the incline which has been used for exit to surface in case of necessity. The ore is an oxide of iron. The principal values are gold. There are twenty men employed.

Holdfast Mine.

Robert Limburg, who owns the Holdfast Mine in the Georgetown district, has developed it to a depth of one hundred feet through an incline shaft that has been equipped with a horse whim for the present. The vein has been developed and several shipments of ore have been made to Anaconda.

the ore being an oxide in character carrying gold. There are six men employed.

The Southern Cross Mine.

The Southern Cross Mine is located in the Georgetown district and has been extensively developed during the past two years. The shaft has been put down to a depth of 400 feet, being equipped with safety cage. The steam hoist is of the Kendall make. In the development several large ore bodies have been discovered, and put in shape for future extraction. The ore is an iron oxide and occurs in large ellipses in the lime. Some 1800 feet of development has been done on the veins during the year. The ventilation was found to be very good. The mine has three exits to the surface. The property has been under the supervision of T. H. Allen, who employs thirty men.

The Venice Mine.

The Venice property is situated at the Gold Coin, of which L. T. Ireland is superintendent. The principal work is driving a tunnel that has reached a length of 1200 feet of which 300 were driven during the year. The principal object was to intersect the several veins known to exist in the district. All these are gold bearing. The work is being carried on in a safe manner.

The Iron Mask.

This property is owned by L. T. Ireland. A tunnel has been extended to a length of 300 feet on the vein to determine the extent of the ore body. Values continue to increase as depth in the mountain is attained. The country formation is lime as far as developed. The system of timbering has been tunnel sets.

The Montana Mine.

The Montana Mine is situated in the Georgetown mining district and is owned by Matt Gaffney and John Ducie of Anaconda. The property has been bonded to a party for a period of two years. They have installed a steam hoisting plant of the Legerwood make of sufficient size to attain a depth of 300 feet. The present depth being 120 feet, showing a well defined ore body carrying gold.

The Eagle Mine.

This property is operated by John Pike and Company, the property being opened by a shaft 75 feet in depth on the vein. The ore is an oxide in character carrying gold. Regular shipments are made to the smelters at Anaconda. The vein shows permanency in character. Six men are employed.

.FERGUS COUNTY.

Extended strikes were made in several of the districts during the year. Operations in the Kendall and Maiden districts were attended with success. Considerable capital has been invested and several plants have been installed for the reduction of the mines' output. The Yogo Sapphire mines were satisfactorily operated and a vast amount of new territory explored. The quality of the stones is equal to any on the market. There was much activity during the year in the Cone Butte and Ford Creek districts. Considerable capital has been invested and plans are under way for the installation of necessary plants.

The Spotted Horse Mine.

This property is located in the Judith range of mountains one mile from the camp of Maiden, and has been recently taken over by the Cumberland Gold Mining company and will be operated in connection with the other properties owned by the company. The ore is conveyed by a gravity tram to the company's mill for treatment, the mill having been enlarged to handle the increased tonnage. The shaft is 400 feet in depth and the equipment consists of a steam plant and cages being used in the operation with all safety appliances attached. The shaft has been repaired, also the workings of the mine, so that operations are carried on in a fairly safe manner. A great deal of exploring has been done to open up the large ore bodies for extraction. These ore bodies carry very high values in gold.

The Kendall Mine.

This group of mines is owned and operated by the Kendall Gold Mining Company and is situated one mile from the town of Kendall in the North Moccasin mountains. The main work shaft is 600 feet in depth, which will be put down to the 1000-foot level in the near future. The mine is equipped with all necessary machinery which for the most part is operated

with electric power. The hoist, which is operated with electricity, is 150 horse power of the double drum pattern. A mill of 350 tons capacity has been running to its full capacity and the development work extensively carried on, 4,900 feet having been accomplished during the year, opening the ore bodies which are kept ahead of extraction. The values contained are principally gold. There are 150 men employed under the management of H. H. Lang. The mode of timbering is square sets and stulls and the mine is properly provided with means of egress and is well ventilated.

The McGinniss Mine.

The McGinniss group of mines is under lease to the Gold Reef Lease mining company. George Turnbull is the general manager. The property is operated through tunnels the longest of which is 1,450 feet. The mine has been developed to the extent of 9,000 feet from time to time. An exploration shaft has been sunk 225 feet and considerable development done from the lower workings. The company is contemplating the remodeling of the 125 ton mill with the necessary machinery for the reduction of the ore, effecting a greater saving of the values, which are principally gold. There are fifteen men employed at present. The company is making arrangements to extend the workings and the plant capacity. The mine is in fairly good condition and is well ventilated.

The Barnes-King Group.

This company's holdings comprise twenty patented claims in the immediate vicinity of Kendall in the North Moccasin mountains. A shaft 300 feet in depth has been equipped with an electric hoist, the entire plant being operated by electricity. The property has been extensively developed during the year, over 3,000 feet having been accomplished, mostly on the north end of the property, developing several extensive ore bodies. The mill and cyanide plant have been operated to their fullest capacity of 200 tons a day. The ore is a silicious lime and lies between sand and limestone walls. The cyanide process saves 90 per cent of the values. The mine is well equipped and well ventilated and has all necessary escapes to the surface. There are 115 men employed by the company. George T. McGee is the general manager and T. W. Heatherly the foreman.

The West Kendall Mine.

The West Kendall group of claims is located on the west slope of the range two miles west of the original mine of that name. Operations are conducted through a series of tunnels, the longest having reached a length of 250 feet having been driven during the year. The vein has been cut and shows considerable free gold. The property is safe as far as developed. Thomas Conley is in charge.

The Cumberland Mine.

The Cumberland mine is situated one mile east of Maiden and is operated by the Cumberland Gold Mining Company, employing 60 men. James Breen is the general manager and superintendent in charge. A perpendicular shaft 250 feet deep has been cut by a tunnel 900 feet long to convey the ore to the mill which has been erected with a capacity of 100 tons. The machinery is of the latest improved style for the recovery of the values. Crusher and rolls and Wilfley tables are used and a cyanide plant is in connection which will effect a close saving of the values. The mill is modern and up to date in every particular which can be increased to a capacity of 400 tons. A vast amount of development work has been done, principally in the ore zone. The mine is in a fair condition regarding safety and the ventilation is good.

The Ford Creek Group.

This group consists of fourteen claims situated on Ford Creek 30 miles north of Lewistown. Operations are conducted by the Ford Creek Gold Mining Company, of which John Lee is the acting manager. The property has been extensively developed during the year by tunnels showing several well defined ore bodies of a cyaniding character carrying gold of high value.

The Gilt Edge Mines.

The Gilt Edge group is situated at Gilt Edge and has been in operation during 1909 and 1910 by the Gilt Edge Lease Mine Company under the management of R. F. Turnbull. Fifty men are employed in the extraction of ore which has been treated in the mill situated at the mine. Three thousand tons a month being treated successfully by the cyanide process. This plant is the third plant of its kind built in the United States, the principal tonnage being mined in open cuts on the surface during the summer season and mining in the lower

portion of the mine in winter, the underground portion being well timbered and ventilated. The ore contains gold values.

The Cone Butte Mining Company.

The Cone Butte Mining Company property consists of 14 claims and is situated 10 miles north of Gilt Edge in what is known as the Cone Butte Mining District. Operations are conducted through a series of tunnels, the longest having reached a length of 700 feet of which 300 feet were driven during the year. A test of the ore has been made to determine the process for treatment. A mill has been in contemplation with a capacity of 250 tons. The operations have been carried on in a safe manner as far as developed under the management of H. A. Rea as acting manager.

The Golden Eagle Mine.

The Golden Eagle Mine is located in the Cone Butte District seven miles north of Maiden. Operations are conducted through a tunnel that has reached a length of 400 feet. The ore is free milling gold. A ten-stamp mill has been constructed on the property for the reduction of the mine's output. The mine is owned by the Murphy Brothers of New York. James Murphy is manager.

The War Eagle Mine.

The War Eagle property is located two miles south of Maiden and is owned and operated by Burt and Stuart. John Wright is foreman of the mine. The mine is opened by two tunnels driven on the vein which are 100 and 400 feet respectively in length. The vein is a fissure and the ore is an iron sulphide carrying values in gold, some being of sufficient high grade to warrant shipping. The work is carried on in a safe manner in the mine.

The Abby Mine.

The Abby Gold Mining Company operates two miles north of Kendall. A tunnel 600 feet in length has been driven to intersect the vein at a depth of 200 feet. A two-compartment shaft has been put down to a depth of 200 feet below the tunnel level which will cut the ore body 400 feet from the apex. A drift has been extended west on the vein and an upraise made to connect for exit and ventilation. The equipment consists of a steam hoist of sufficient capacity to main-

tain a depth of 700 feet. The mine is safe as far as developed. Allen Johnson is in charge and employs 12 men.

The North Moccasin Group.

This group is situated at Kendall and is owned by the North Moccasin Mining Company. A shaft has been sunk which has reached a depth of 325 feet. The equipment consists of an electric hoist and a cage with all safety appliances attached. The mine has not been in operation since the early part of the year owing to some disagreement among the company. When in operation 60 men were employed. Several hundred feet of drifting and tunnel work have been accomplished during the year. The mine is supplied with all necessary escapes and the ventilation is good.

The Golden Discovery.

This property is situated one mile west of Kendall and is operated by the Golden Discovery Mining Company which has been in operation during 1909. Operations ceased during the present year. The property is developed through a two-compartment shaft which reached a depth of 500 feet on the 300 foot level. A crosscut has been extended to the north a distance of 350 feet to determine the values contained in the ore body. The ore bodies are very extensive as far as developed. The equipment consists of a steam hoist, cages, and so forth. Employs nine men.

The American Sapphire Company.

The property of this company is located on Yogo creek and within three miles of the London Company's property. It employs 30 men. H. O. Chowan is the superintendent. The mine is operated by tunnels having been driven in the dike a length of 1,300 feet. Mining has been conducted similarly as in metalliferous mining. The dike runs to chutes and conveys to a plant which has been erected for the recovery of the stones. The plant is equipped with giggs and revolving screens for the recovery of the values contained in the vein material.

The Gold Link Mine.

The Gold Link Mining Company is situated at Kendall and has developed the Gold Link claim to a depth of 400 feet, showing a very extensive ore body. The company is contemplating continuing the shaft until the 700-foot level has been reached. The equipment consists of a boiler and hoist

of the Ledgerwood make. Twelve men are employed on the property.

The London Sapphire Company.

This property is situated on Yogo creek, 40 miles west of Moore, a town on the Milwaukee railroad. The property is under the supervision of Charles Gladsen and W. A. Danforth, foreman. Forty men are employed. Heretofore the larger part of the material was worked by sluicing, the dyke being worked in places by this means to a depth of 50 feet. The part of the dyke which permitted this kind of mining is about exhausted, shafts having been sunk to a depth of 100 feet and the material has been extracted in the same manner as is followed in metalliferous mining. The material is taken to the surface and allowed to disintegrate before being run through the sluice boxes where the gems are recovered. The mine has been operated at intervals during the past year owing to a stagnation of the markets.

FLATHEAD COUNTY.

The mineral resources of Flathead county are very extensive in area. Several districts in this county offer unequaled inducements to capital for the development of profitable producing mines. The mineral showings of the Flathead reservation in gold and silver are not excelled anywhere and the lodes which are developed to any extent prove them to be strong, persistent fissures. Discoveries of promising copper bearing lodes have been made on the Flathead reservation, showing well defined veins in granite formation.

The Okedale Mine.

The property operated by the Okedale Mining Company, of which R. H. Hutchison is the general manager, is located two miles north of Java. A tunnel has been driven a length of 1,000 feet to intersect the vein at a depth of 700 feet. Driving east and west on the vein is in progress at the present time. The values are principally copper. The works are securely timbered as far as developed under the supervision of John Parks. There are eight men employed.

The Northern Mine.

The Great Northern Mine is situated one mile north of Java on the Great Northern railroad. It is operated by the Great Northern Copper Company. Operations are conducted through

a series of tunnels ranging from 200 to 500 feet in length on the vein. Three hundred feet of development work has been accomplished during the year. Upraises have been made for ventilation and escape to surface. The mine as far as developed is in a fair condition regarding safety. W. L. Lloyd is superintendent and employs eight men.

The Leupfer Mine.

This property is situated 8 miles west of White Fish and is operated by the Leupfer Mining Company, of which George Hoffman is the superintendent. Six men are employed. The property has been developed by a shaft which has been sunk to a depth of 150 feet. The equipment consists of a steam hoist. The vein has been explored east for a distance of 150 feet, showing a well defined vein in porphyry and lime. The ore is sulphide and carries copper as its chief value.

The Lippincott Mine.

This group of four claims is situated in the Essex Mining District and is owned by Jack Stewart. The property is being developed under his supervision. Three tunnels have been driven on the various claims to a length of 150 and 200 feet respectively on the vein showing copper of commercial value. Several shipments have been made recently. The lower tunnel will be extended to a length of 1,000 feet into the mountain.

GRANITE COUNTY.

There has been much activity in the various mining sections throughout and promising veins have been opened up, several of them producing. From the present development the mineral possibilities are great and development made with practical assurance of success. The old camp of Granite has been inactive outside of furnishing employment to miners engaged in leasing the old workings of the mines. The Consolidated Granite Bi-Metallic Company is operating on the Philipsburg side through a tunnel which was driven for drainage purposes.

The Gold Center.

The Gold Center property is located in the Garnet Mining District. Operations have been carried on by tunnels which have been extended during the year to a length of 300 and 400 feet respectively on the vein and the extraction of ore

has been carried on, shipments having been made to East Helena. The principal values are gold. The property is in a safe condition.

Mount Royal.

The Mount Royal Mining Company's property is situated ten miles west of Flint and is under the management of L. Lumus. Operations are by a tunnel that has reached a length of 500 feet. Developing the property has been continuous during the year. Ten men are employed.

Surprise Group.

This property has been leased to a company under the supervision of George Erlinger. A shaft has been put down to a depth of 100 feet exploring the vein east and west at that point. This was in progress at the time of my inspection. There is a showing of several ore bodies of a milling character which will be conveyed to the mill for treatment. The mill is situated on the property.

The Crescent Mining Company.

The Crescent Mining Company is at present confining itself to the systematic and extensive mining of its property, which is located on Rock Creek. The company is having a tunnel driven 1,700 feet to cross-cut several known veins in that locality. The work is being done with power drills operated by an Ingersoll compressor. Six men are employed at the property.

The First Chance Mining Company.

The First Chance Mining Company's holdings consist of thirty-two patented claims located at Garnet and owned and operated by Mitchell and Mussigbrod. The property was extensively developed during the year, 900 feet being accomplished on the veins. An incline shaft 200 feet deep was sunk and the vein drifted on for 500 feet, opening up an ore body 300 feet in length. Several of the other claims have been worked successfully by lessees who in the aggregate have produced a considerable tonnage of high grade ore. A material percentage of the vein is shipping ore which is treated mostly at the Butte smelters. The lower grades of materials are treated in the works which are a part of the property and consist of a ten-stamp mill with plate amalgamation followed by concentration, over vanners and Wilfley tables, and the

tailings and slime from this process are run over a large area of California slime tables, the whole process recovering a satisfactory percentage of the values.

The Gold Reef Mining Company.

The property operated by the Gold Reef Mining Company consists of a group of four claims located eight miles up Flint Creek under the supervision of Oliver B. Flinn employing 25 men. The property is operated through two tunnels respectively 800 and 700 feet in length and have been connected by an upraise providing the workings with ample ventilation and escape. The ore is an oxide of iron carrying gold as the principal value. A 50-ton mill and cyanide plant have been installed in connection to reduce the mine's output.

Golden Eagle Mine.

This property is located in the Red Lion District on the divide. Operations are conducted by the Allen Gold Mining Company. Some very extensive development has been accomplished during the year, extending the tunnels to a length of 800 and 900 feet respectively. The ore is of a free milling nature, its values being principally gold. The work has been conducted in a safe manner under the management of W. R. Allen.

The Sunday Mine.

This property is quite extensively developed, two tunnels being driven on the lode developing a large tonnage of milling ore. Active work has been under way for some time on the property putting it in shape to produce a good tonnage. This is in anticipation of the erection of a mill to treat the product. Every possible contingency in so far as a loss of values is has been provided for. Any device that would promote the cheap handling of the product without impairing efficiency is supplied. The work has been confined to a tunnel which has reached a length of 1,200 feet, of which 200 feet was driven during the year under the supervision of John Allen.

Northern Bell Group.

The Northern Bell group operated by E. L. Pritchard is situated at Princeton. The work of developing the claims consists in sinking a shaft to a depth of 100 feet, cutting the vein at that depth east and west a distance of 125 feet, showing sulphides in the vein filling carrying gold and copper.

Bimetallic Mines.

The old mines of the Granite and Bimetallic Mining Company have been operated by the company during the year after a long period of inoperation, giving employment to sixty men. The upper portion of the mine has been operated by several parties of leasers, making a total of men employed about eighty. The ore is conveyed through a tunnel that has reached a length of 8,500 feet which was driven for drainage purposes. The property is under the supervision of M. E. Blonger.

Modock Mine.

The Modock property is being developed by Highland Prichard and is situated in the Red Lion district. A shaft has been sunk to the 100-foot level drifting on the vein to the extent of 80 feet east and west had been accomplished at the time of inspection. The property is equipped with a gasoline hoist for prospecting purposes.

The Brooklyn.

The Brooklyn group has been developed extensively during the year, 700 feet having been accomplished. Operations have been carried on through a tunnel which has encountered a vein of silver-lead ore from which regular shipments are made. A raise has been in course of construction from the face of the works to the surface for exit and ventilation which will put the property in a safe condition.

The Shamrock.

The Shamrock mine, located at Garnet, is operated by P. S. McDermott and C. Lannon, the principal owners. The operation has been driven both ways on the vein. Levels have been driven both ways on the vein. The operations have been confined mostly to the upper workings to avoid the expense of water handling. Regular monthly shipments have been made, the values being principally gold.

Tussel Mine.

This property is situated 15 miles northeast of Flint and is operated by Pete Swanson and William Williams, who are owners of the property. Operations have been conducted through an incline shaft that has been sunk to a depth of 185 feet in a granite formation. The equipment consists of a steam plant. The vein is a persistent fissure carrying high values in gold and copper. Regular shipments are made.

The Hope Mining Company.

The property of this company is located at Philipsburg and has been in constant operation for thirty years. Operations on this old property during the past two years have been confined to prospecting for new ore bodies, driving tunnels and working on the odds and ends of former large chutes of ore, occasionally encountering a small chute of ore in the new development in the property. J. R. Lucas is superintendent.

Two Per Cent Mine.

This is situated on the divide between Granite and Philipsburg mining districts. Operations are conducted through an incline shaft which was put down on the vein to a depth of 200 feet which was equipped with a gasoline hoist for the purpose of developing the property, the vein being a contact in lime and shale showing some very high grade ore in silver and of which several shipments have been made.

Grant and Hartford.

The Grant and Hartford property has been operated under a lease and bond to Stevenson and Company. Explorations of the mine have been carried on chiefly through tunnels having been driven a length of 500 feet during the present year. This uncovered a well defined ore body. The values contained are principally gold.

JEFFERSON COUNTY.

Active preparations are being made for the resumption of mining on a large scale. The Wickes and Corbin districts are the most active and the permanency of the ore bodies is being shown by the vast amount of development done. The Clancy and Warm Springs district have not been as active as in the past.

The Corbin Pennsylvania Mining Company.

This company is developing a promising property in the Corbin district under the management of Homer Emerson with John Lawrence as foreman. The vein has been explored through a shaft which has been put down to a depth of 125 feet, and 600 feet of development has been done on the strike of the vein at that point, showing a well defined fissure vein of a strong character carrying copper in the vein filling.

Golconda King Group.

The Asset Gold Mining Company is developing a very prom-

ising group of claims in the Golconda district under the management of W. E. Farlow. The mine produces high grade ores carrying gold of a free milling character and is developed by a series of tunnels. The lower tunnel, which has reached a length of 400 feet, will be extended through the various claims to prove the constancy of the ore bodies.

The Center Reef.

This property is operated by the Ballard Mining Company, E. G. Ballard superintendent, employing nine men in the operations. Several tunnels have been driven to a length of 250 and 400 feet, cutting the formation. An exit of 150 feet has been put through to the surface for ventilation and escape. The ore is of a free milling character, principally gold. This property has been worked continuously during the year.

The Leadville Mining & Smelting Company.

The group of claims developed by this company lies 14 miles west of Basin. Work on the property was commenced during 1905. A shaft equipped with a steam hoist has been sunk to a depth of 175 feet. Exploring work has been done to the extent of 300 feet. From that point on the vein a tunnel has been in course of construction to cut the vein at a much greater depth, having reached a length of 300 feet. The ore is of a concentrating character and the company is contemplating the erection of a plant. The property is under the supervision of Charles A. Cortrell.

The Golden Curry Mine.

The Golden Curry group of claims is located on the right fork of Elkhorn Creek one mile west of Elkhorn, and is operated by the Golden Curry Mining Company of which John Rothfus is the manager and A. Sincock foreman. The company employs 25 men. The property is developed through a series of tunnels ranging in length from 200 to 700 feet respectively, the vein being tapped at a length of 300 feet from the surface. The ore is an iron sulphide carrying gold as its chief value. Regular shipments are made to East Heelena. The workings have been made secure by timbering.

The Rosa Mine.

This property, which is situated in the Clancy Mining District, has been operated by the Progress Mining Company, F. J. McCormack is the superintendent. Operations consist of

a shaft 100 feet deep, at which point the vein has been developed a length of 500 feet. The equipment consists of a gasoline plant, the work being done for exploring the country. Silver and lead are the values.

Knob Hill.

This property is operated by the Knob Hill Mining Company, situated in the Clancy Mining District. Operation is by an incline shaft which has reached a depth of 200 feet, drifting east and west on the vein. A length of 300 feet has been done to determine the extent of the values contained, which are silver and lead. The property has been equipped with a steam plant. William Steue is superintendent.

The Elkhorn Mine.

This property is operated by the Elkhorn Silver Mining Company. J. H. Longmaid is the general manager and J. Bowden superintendent. William Williams is the foreman. The property is being developed to a depth of 2,300 feet on an incline of 65 degrees. The property has been developed extensively during the year, opening several extensive ore bodies. The mill has been equipped with the latest improved machinery for the reduction of the ores, including twelve Frue vanners which are saving 95 per cent of the values. The principal values contained in the ore are silver and lead. The mine is kept in a fair condition, the ventilation being excellent. Two hundred men are employed by the company.

Butte-Elkhorn Mining Company.

The Butte-Elkhorn Mining Company is developing a very promising property in the Elkhorn Mining District known as the C and D, the property having been repaired and put in shape for operation under the supervision of J. H. Miles. The shaft has reached a depth of 240 feet. A steam plant has been installed of sufficient power to reach a depth of 400 feet. Five hundred feet of opening have been made during the year, cutting several ore bodies of an iron oxide character. The value is gold.

The Ruby.

This is owned by Patrick Dowling and is situated in the Low Land Mining District. The mine has been extensively developed during the year, 1,100 feet having been accomplished. The main tunnel has reached a length of 2,700 feet. A shaft

has been equipped on the surface to hoist the product from the lower portions of the mine. Its present depth is 400 feet. The system of mining is safe. The company employs 25 men at present under the supervision of P. J. Dowling.

The Copper King Group.

This group is located southwest of Corbin and is operated by the Minneapolis Corbin Copper Company. Patrick Meany is the general manager. Operations are conducted through a perpendicular shaft which was sunk to a depth of 225 feet during 1909, and development work on the vein east and west has been extended a distance of some 400 feet, showing some very extensive vein filling which is mineralized very highly, showing copper and silver values. Seventeen men are employed by the company.

The Black Jack Mine.

The Black Jack group is located in the Corbin district and was in operation during 1909 and operations ceased early in the present year. The property has been extensively developed during the time it was in operation, uncovering some very extensive ore bodies. The vein has been developed a distance of 500 feet west of the shaft. A more substantial shaft to the surface was to be raised out from the lowest workings for extensive operations when closed. The present prospect shaft will be abandoned and kept in repair for ventilation and exit to the surface. The property is owned by the Black Jack Copper Mining Company, Matt Dunn being the manager. The property has an extensive showing for a much deeper development. Its principal values are copper, silver and lead. Twenty men are employed.

The Columbia Mine.

This property was operated under a lease and bond during the year, James McDowell acting as superintendent. The property was developed by putting a shaft down to a depth of 100 feet. A tunnel has been extended to a length of 200 feet which will intersect the vein at a much greater depth. Several ore chutes have been exposed and shipments were made with satisfactory returns. The values are principally gold.

The Sidewinder Mine.

This property is situated on the divide five miles west of Wickes. It is operated by Kidney & Company, they having

bonded the property for a period of two years. Machinery has been installed for the purpose of unwatering the mine. The mine will be repaired and put in shape for operation. The shaft will be put down 100 feet below the present workings, which will be 300 feet. James Madden is the superintendent and employs ten men.

Carbonite Mine.

This group is located five miles north of Whitehall. The group is owned by A. R. McDonald, who is the acting manager. Several tunnels ranging from 50 to 250 feet in length have been driven to tap the vein during the present year. The property at present is in the prospective stage of development. Some small chutes of ore of good quality have been uncovered and indications are that large and more permanent bodies will be discovered.

The Alta Mine.

The Alta group has been taken over by the Boston and Alta Mining Company, work on the property being resumed in December, 1909. A complete plant has been installed of sufficient size to attain a depth of 1,000 feet. A two-compartment shaft has been sunk to a depth of 700 feet, where a crosscut has been driven to intersect the vein a distance of 1,400 feet in length. The old portion of the mine and shaft will be put in repair for future development and for the means of escape and ventilation. The plant is electrically driven, having secured power from the Jefferson Power Company, which is interested in the mining enterprise under the management of M. L. Hewitt. James Madden is the foreman and employs 30 men.

The Buckeye Mine.

This group of claims is located on the divide between Jefferson and Lewis and Clark counties. It is operated by the Truso Mining and Production Company. J. Rodgert is manager and John Davey foreman, employing 15 men. The present working shaft has a depth of 200 feet. Equipments consisting of a steam hoist and a three-quarter inch steel cable. At the present time a bucket is used in the operation, which will be replaced by a cage in the near future. The raising of an exit to the surface has been accomplished, which ventilates the greater portion of the mine. The concentrator has been kept in operation treating the output, which is about 50 tons per

day, the ore being of a concentration character carrying copper, lead and silver.

The Daphaney Mine.

The Daphaney group of claims, situated in the Corbin district, is operated by the South Butte Copper Mining Company. A shaft has been put down to a depth of 165 feet, a tunnel having been driven on the vein a distance of 400 feet and connections are made at that depth which afford ventilation and exit to the surface in case of necessity. The ore is a sulphide carrying copper. The formation is a porphyritic granite. R. H. Sheafer is the manager.

The Surprise Mine.

This is being developed by the Chicago and Corbin extension Mining Company, who are developing a group of claims in the Corbin district through a series of tunnels, the lower tunnel having reached a length of 700 feet on the strike of the vein. The tunnel has been extended 400 feet during the year. A small compressor has been installed for the purpose of furnishing air to the machine drills, the power being produced by a gasoline engine. The principal values contained in the veins are copper, silver and gold, which shows permanency in the developed portion of the mine. J. K. Harris is the superintendent, employing six men in the development.

The Rose Mine.

The Rose Group of claims is situated in the Golconda Mining District five miles south of Jefferson city. Operations are conducted through a series of tunnels having been driven a length 400 and 600 feet cutting some very high grade ore of a free milling character thus opening large ore reserves which will increase materially the ore extraction. John Montgomery is the Superintendent in charge.

The Good Cheer Mine.

The Good Cheer Group of claims situated 7 miles South of Clancy are operated by the Good Cheer Mining Company. The property had been closed for a short period but are again resumed at the mine which was unwatered and put in shape for future operations. The development consists of a two compartment shaft 200 feet in depth equipped with a steam boiler and hoist. The workings will be repaired and further development carried on to ascertain the future of the property.

The company is contemplating the erection of a concentrator the ore being of a concentrating character. The property is under the management of Joseph Garnieu employing 9 men.

The Corbin Copper Company.

This group of claims is situated at the head of Clancy creek in the Corbin Mining district where extensive development work has been carried on through tunnels, several of them ranging in length from 300 to 1200 feet. The principal portion of the work has been confined to the Dewey and Bonanza claims, the ore bodies being more extensive and carrying the greatest amount in copper and silver, in the group. A concentrator of 100 tons capacity has been constructed for the reduction of the present output which can be enlarged from time to time as the property may require. The openings have been properly secured as far as developed under the management of Frank E. Richards. Quinn Crowley is acting foreman. It employs 40 men.

Silver King Mine.

The Silver King Group of Mines is operated by the Corbin Copper Metal Company under the management of John Hay and Jerry Murphy being the foreman. The development consists of a two compartment shaft put down 500 feet on an incline of fifty degrees, a skip being used in the operation equipped with all safety appliances. The plant is operated by electricity procured from the Jefferson Power Company a short distance from the mine. The vein has been extensively developed at the 500 foot level to ascertain the continuity and the values contained in the ore bodies which have been developed at that depth. The vein is a persistent fissure in granite showing good values in copper, lead and silver with a small percentage of zinc. There are 20 men employed by the company.

The Bertha Mines.

This group is operated by the Boston and Corbin Copper Mining company which has been under the management of Homer Emerson, Martin Backston the acting foreman. Thirty men are employed by the company in developing the property. A tunnel 1400 feet long comprises the upper workings with additional openings, cross cuts and raises to the surface. Several openings have been made through the ore bodies to connect with the upper workings to ascertain the continuity of

the ore. The property has been developed very extensively during the year. Fifteen hundred feet has been accomplished. A two compartment shaft has been put down to a depth of 500 feet below the tunnel level and the vein has been extensively developed at that depth. The plant has been equipped with electric power throughout of the Webster Camp and Lane make. The company is considering the best method of concentration before the installation of the concentrator for the reduction of the mine output. An exit has been opened from the last level to the surface for ventilation and escape.

The Minnesota Mine.

The Minnesota, one of the oldest discoveries in the Gregory district is situated three miles North of Wickes and has been operated by the Calumet and Corbin Copper company having sunk a two compartment shaft 400 feet in depth. A vast amount of development has been done on the various levels, some 2000 feet having been accomplished. The surface equipment consists of a boiler and steam hoist. The property has recently closed temporarily. When in operation 25 men were employed. W. C. Hoskins being the manager and J. E. Dunston the foreman.

The Sun Group.

This group of claims situated in the Corbin District has been taken over by the London and Corbin Exploration company under the management of R. W. Bush. Thomas Paul is the acting foreman. A two compartment shaft has been sunk to a depth of 150 feet; equipped with a steam hoist of sufficient size to insure safety. A much larger plant will be installed when greater depth is required. The upper portion of the surface has been developed by a series of tunnels ranging in length from 100 to 500 feet all of which was accomplished during the year. The country formation is granite showing a strong mineralized vein carrying copper and silver.

The Blue Bird Mines.

The Blue Bird Group of Mines is situated five miles North of Wickes and is operated by the Michigan and Montana Mining and Developing Co. Operations are through a series of tunnels which have reached a length of 2000 feet principally on the strike of the vein. Connection has been made with the upper portion thus making the tunnel the main artery to the mine. A winze has been sunk to a depth of 200 feet below

the tunnel level developing the vein and the extraction of ore has commenced at that point during the year. The ore is a sulphide carrying gold, silver and copper. The mine is fairly well ventilated. The company employs 35 men in development and ore extraction. This number will be materially increased in the near future. The entire plant is electrically driven under the management of F. L. Davis.

The Hattie Ferguson.

The Hattie Ferguson Mine situated five miles North of Basin has been operated by the Pennsylvania Montana Mining Company of which J. H. Hildebrand is Superintendent. Operations are carried on through a tunnel of 400 feet, the greater portion having been driven during the year. The character of the ore is silver lead.

The Abe Mine.

This mine is situated in the Bluebird District which has been opened by a tunnel 400 feet in length on the strike of the vein which will be extended until the 1000 foot mark has been reached. The work is in the nature of developing the country to ascertain the continuity of the ore bodies. The work has been under the management of R. A. Graham. Six men are employed in the development.

The Robert Emmett.

The Robert Emmett Copper Mining Company is operating in the Amazon district. A perpendicular shaft has been put down to a depth of 500 feet. One hundred and fifty feet has been sunk in the last year. A tunnel 600 feet in length has been connected with the shaft at a depth of 170 feet the same being used for drainage and ventilation. Developing the vein East and West has been continuous during the year; 500 feet having been accomplished since the resumption of operations. The ore is a sulphide carrying copper, silver and lead. The country formation is granite. The entire plant is electrically driven throughout. The plant is a model of its kind. The property is under the supervision of Daniel MacGinniss employing 25 men. Operations are conducted in a safe manner.

The Silver Star Mine.

The Silver Star Group operated by the Amazon Montana Development Company is situated at Amazon. H. W. Graham is the manager and Peter Hanland the foreman. The operation consists of a two compartment shaft which has been

sunk 300 feet during the year. The vein has been developed at that depth showing some very high grade ore. The values contained are gold, silver and lead. A connection has been made to the shaft by a 700 foot tunnel which furnishes ample ventilation and escape. For the present the entire plant is electrically driven. The work has been satisfactory as far as developed. The company employs 21 men.

The Hidden Treasure.

This property is situated one mile North of Corbin and is operated by the Montana, Corbin Copper Company. The property has been equipped with a steam hoist of sufficient capacity to attain a depth of 500 feet and cages with all safety appliances attached. The shaft has reached a depth of 400 feet, 200 feet having been added during the year with additional development having been done on the vein, to the extent of 800 feet being accomplished during the year. The vein shows up very well as far as developed. The property is under the supervision of W. B. Gibson, employing 17 men.

The Blizzard Mine.

This property which is operated by the Blizzard Mining company is situated one mile East of the Blue Bird Mine. The company having commenced operations during the year. The openings consist of several tunnels ranging from 200 feet to 700 feet. A shaft has been sunk 100 feet below the lowest workings during the year where the extraction of ore has taken place. A steam hoist has been installed to carry on the operation. The property has been in charge of W. E. Thompson employing 15 men.

LEWIS AND CLARK COUNTY.

Lewis and Clark county has a great area of mineral territory bearing gold, silver, lead and copper with the former largely predominating, and offers attractive opportunities for the successful development of large and profitable producing mines. There is the Valley Forge mine at Rimini. Here a tunnel has been driven to a length of 1800 feet to cut out the vein at a greater depth. These districts merit more attention from the mining public than it has so far been accorded.

In the Marysville district many meritorious prospects are lying idle waiting for actual development to bring them in the producing class of mines. The Bald Mountain Group of

claims now operated by the Cruse Mining company and producing thousands of dollars monthly was considered worthless until a certain amount of development had been done and the vein been explored which has proven the property to be in the million dollar class of mines. I am strongly of the belief that were a limited amount of capital judiciously expended in the development of these several districts as good mines as have been found in the state would be discovered. All that is necessary is for capital to become interested in the proper development of its many hundred of promising gold, silver and copper bearing prospects.

The Caroline.

The Caroline group of seven claims which are located four miles West of Helena has been operated by F. J. Glenn. During the present year a shaft has been sunk to a depth of 80 feet on the vein, at that point the vein has been explored East and West a distance of 70 feet showing several chutes of high grade ore containing gold values.

Bell Boy Mine.

The property of the Bell Boy Mining Company is situated five miles North of Marysville. It is under the management of Edward Beadle. The property has been recently repaired and put in operation, the former mining being done through shafts. With a great volume of water to contend with, the work now in operation is by a tunnel which will do away with the expense of water handling. The extent of the tunnel is to be 500 feet.

The Sibley Mine.

The Trampler Bros. are operating the Sibley properties situated two miles South of Marysville. The development consists of a tunnel 500 feet in length where the vein has been cut. From this point a drift has been driven a length of 200 feet on the vein revealing several large ore bodies of a concentrating character. A three stamp mill has been erected which will test the ore and ascertain the best process of treatment.

The Rose Mine.

The property of the Rock Rose Mining Company situated four miles West of Helena, has a two compartment shaft which has been put down to a depth of 150 feet. The vein

has been developed on the strike, East and West, a distance of 400 feet showing several bodies of commercial ore of a lead, silver character. The formation of the country is slate with a conglomerate vein filling. The equipment consists of a steam hoist and steel cable $\frac{3}{4}$ inch in size.

Standard Mine.

This property is situated in the Marysville district and is operated by the Standard Mining Company. Several tunnels are in operation having been driven to a length of 700 and 800 feet where the vein has been encountered showing several ore bodies carrying commercial values in gold. In the exploring work six men are employed.

The Strawberry Mine.

This promising property has been operated during the year by Gaustin and the Henderson brothers. A shaft has been sunk 75 feet and a short level driven on the vein from which several shipments of high grade gold ore were extracted.

The Gold Leaf Mine.

This property is situated in the Stemple unorganized mining district and is operated by William Burkhead who is the original owner. A tunnel has been driven to a length of 300 feet where the ore body has been tapped, and ore extraction has commenced at that point, the ore being free milling character is treated in a five stamp mill which has been erected on the property. The mine is being kept in safe condition as far as developed.

Evening Star Group.

The Evening Star Group has been developed very extensively by the Victory Gold Mining Company under the management of J. A. Rowand, the discovery being made on the mountain top which necessitates a very heavy expense to convey the ore to the mill. A tunnel has been driven from the base of the mountain where all ore mined will be gravitated to the mill by tram, effecting a great saving. The tunnel is 700 feet long. An upraise which will connect all upper workings with the tunnel has been in course of construction which will furnish ventilation and escape in case of necessity. The value contained is gold, the ore being an iron oxide in character, which will be treated by the cyaniding process for the recovery of the values which are principally gold. The company employs 20 men.

Little Dandy Group.

This property is situated two miles East of York. Operations are conducted by the French Bar Gold Mining and Milling Company, there being seven claims in the group operated through a series of tunnels from 100 to 500 feet in length. A winze has been put down 50 feet below the main tunnel for the purpose of ascertaining the extent of the veins. Several openings have been made to the surface which furnish ample means of escape and ventilation. The ore values are principally gold. A cyanide plant of 100 tons capacity is in course of construction for the reduction of the mine output which will be greatly increased in the near future. The company has installed an electric plant which furnishes ample power for the entire plant. The property has been under the management of C. A. Davis, employing 20 men.

The Honey Comb Mine.

The Honey Comb Group is situated three miles West of Marysville and is operated by the owner Frank Locker and Company. A shaft has been put down to a depth of 200 feet for prospecting purposes and is equipped with a 7x12 Fraser Chalmers steam hoist and $\frac{5}{8}$ inch steel cable. Considerable drifting and exploring has been done East and West from the shaft, the work being confined wholly to prospecting the country and developing the ore bodies which are of a free milling character. The values are principally gold.

The Golconda Mine.

The property of the Golconda Gold Mining Company is situated in the Gould Mining District one-half mile West of the Jay Gould Mine. A cross cut tunnel has been driven to a length of 27 feet which has cut several veins of gold ore which is of a free milling character. The property has been extensively developed during the year under the supervision of G. O. Tegnell.

The Brooklyn Bridge Mine.

The Brooklyn Mining company operated this property during the year employing 15 men in the operation. The property is situated 7 miles south of Helena. It is the intention of the company to unwater and set the property to operating again in the near future. Considerable development has been done on the vein but as yet it has not penetrated through the iron capping. The mine equipment consists of a steam hoist

and pumping plant. All necessary precaution has been taken in the development, the necessary exits being made to the surface for ventilation and escape. The mine has been developed under the management of John Kruger.

The Strawberry Mine.

The Strawberry Mine is situated in the East fork of Skelly Gulch and is operated by the Strawberry Gold Mining Company of which R. E. Hendricks is Superintendent, employing 14 men. Development consists of an incline shaft 185 feet deep from which 600 feet of exploring work has been done. A tunnel 400 feet in length is in course of construction to tap the lowest working. The ore will be conveyed by tram to the mill doing away with the hoisting and the pumping. A ten stamp mill has been erected for the reduction of the product, the values being gold of a free milling character. The mine has the necessary escapes to the surface and the ventilation is good.

East London Mine.

The East London property has been taken over by Thomas Cruse. Work on this property commenced during the present year. An incline shaft was sunk 200 feet and a gasoline hoisting plant installed and the vein drifted on for a length of 300 feet. The vein is a strong gold bearing fissure and gives every promise of developing into a good producer. Sinking will be resumed and with the additional depth gained it is confident that a body of merchantable ore will be uncovered. The property is under the management of Ed Farrell, 12 men are employed.

Bald Mountain Mine.

This group of mines is operated by Thomas Cruse. It is situated in the Marysville district. Operations are conducted through a series of tunnels having reached a length of 900 and 1500 feet respectively. Connections have been made from the lowest point to the surface affording an escape in case of necessity, also ventilation is excellent. A vast amount of development has been done in the mine during the year, 3000 feet having been accomplished. The 20-stamp mill in connection has been in constant operation during the year, treating the output of the mine. There are seventy men employed under the supervision of Mike Hurley.

The Bessil Mine.

The Bessil mine is located two and a half miles Northeast of Austin and is owned by Messrs Edward Geyson and Company. A shaft 150 feet has been put down on the property equipped with a steam hoist which has been connected with the tunnel which has been driven a length of 300 feet furnishing ample ventilation and exit to the surface. The extraction of ore has been continuous. Regular shipments have been made to East Helena.

The Empire Syndicate.

The Empire Syndicate has taken over the Empire Mine which has not been operated for 12 years. The company has unwatered the mine and the ore has been given a general test to determine whether the values will justify further development. The Company is employing 15 men in the operations under the management of J. S. C. Wells.

Annie Laurie.

This property owned by Charles Gabish is situated in Skelly Gulch, 18 miles West of Helena, and is developed by two tunnels having reached a length of 700 and 300 feet, showing a well developed ore body of a free milling gold ore character.

The Jay Gould Mines.

This property is operated by the Gould Consolidated Gold Mining Company, the property of the Hubbard Mining Company having been taken over by them forming the consolidation. The properties are so situated as to be conveniently operated through the same plant. The ore is conveyed direct from the mine to the mill by tram. The tunnel has reached a length of 2300 feet. The ore is free milling gold and what is not saved through amalgamation is secured cyaniding. A one hundred and twenty-five ton mill has been erected on the property. The attention of the company has been devoted to the erection of a power plant for electrical purposes, the plant being almost completed. The entire plant will be electrically driven. The wood supply being very scant in the district the mine is operated with a reduced force for the present. Forty-five men are employed. Owen Byrnes is general manager.

The Belmont Mine.

This group of claims is situated a short distance west of Marysville. It was formerly owned by the Belmont Mining Company but has been taken over by the Cruse Mining Com-

pany and worked in conjunction with the Bald Mountain Group. Connections are made so the ore is transported by tram to the mill on the Bald Mountain side. Several thousand feet of developing has been done by the new company for exploring purposes and to ascertain the continuity of the ore body. The property is maintained in good condition regarding safety and ventilation.

Mother Lode Claim.

The Mother Lode is situated on the East of the Whitlatch mine in the Marysville district. The property was in operation during 1909. Operations ceased during the present year owing to some trouble in the company's ranks. A tunnel 900 feet long has been driven for exploration purposes. The vein is a contact between lime and granite and large bodies of ore have been developed. A connection to the surface has been made from the stoping portion of the mine for ventilation and exit to the surface in case of accident. Operation of the property is looked for at an early date.

Valley Forge Mine.

The Valley Forge Group of Mines is located at Rimini and is operated by the Valley Forge Mining Company. The property has been closed during the year, aside from a party of leasers who have extracted several cars of high grade ore. The Company has recently unwatered the lower portion of the workings with the view of starting operations. The lower tunnel will be driven to intersect the vein at a depth of 700 feet below the lowest workings of the mine and when completed the upper portion will be connected with a raise for the transporting of the ore to the railroad which ore is lead-silver in character.

Emma Group.

The Emma Group consists of six claims in the Rimini District. This group is owned by W. B. Phillips and C. H. Power of Helena. At date of report September 14th, a cross cut tunnel is being run to tap the lead at a depth of over 500 feet. It was in 450 feet. Surveys indicate that the tunnel will extend to 1600 feet. The ore is lead-silver and copper bearing.

LINCOLN COUNTY.

Lincoln County has not attracted the attention which this mineral bearing section merits. The camp of Sylvanite has been the most active during the year. Considerable capital has been invested and plans are under way for the installing of the necessary plants for the reduction of the ore which is of a concentrating character. Promising copper lodes have been found on the North fork of the Flathead River. The Libby and West Fisher districts show a steady improvement.

The Great Northwest.

This property consists of four claims situated 11 miles South of Troy and is owned by Robert Gregg. Operations are conducted by a series of tunnels ranging in length from 200 to 400 feet on the vein, carrying values in silver and lead. The principal work has been developing the vein to ascertain the continuity of the ore bodies. The development work has been very extensively carried on during the year and the workings have been securely timbered.

The Big Eight Mine.

The Silver Torrent Mining Company owns three claims comprising the Big Eight Group of which John Downey is the Superintendent. The mine operations are carried on through tunnels, the lowest being driven from the creek bed and cuts the vein a depth of 600 feet. An intersecting tunnel has been driven through the ridge and this affords an exit and ventilation. The following development work has been done during the year. A tunnel has been extended a length of 500 feet. The formation is hard black slate. The vein is a true fissure carrying silver, lead and zinc. The property is in a fair condition regarding safety.

The American Kootenai Mining Company.

This company is operating two claims, the Gold King and the Gold Bug located on the west Fisher Creek, thirty-five miles south of Libby. Developments are carried on through two tunnels of 250 and 400 feet respectively which are connected by raises. Operations ceased in the early part of the year owing to a snow slide destroying the greater part of the mill and by which the company sustained a great loss. Work has been resumed on the mill which has been repaired. Resumption of work in the mines will be at a very early date.

An aerial tramway 2240 feet in length has been constructed for transporting the ore to the mill. The chief values contained in the ore being gold. John A. Town is the manager.

The Silver Crown.

This property is situated ten miles South of Libby and is operated by the Silver Crown Mining Company of which J. K. Oaks is General Manager. In the development of the property a tunnel has been driven on the vein 500 feet and several shipments of ore have been made. The values are lead and silver. The reduction plant at the property has not been in operation during the year as only the high grade ores have been extracted. The property has several openings to the surface. The ventilation is excellent.

The Keystone Group.

The Keystone Group is operated by the Lincoln Gold Mining Company. The property is situated twenty-four miles north of Troy in the Sylvanite Mining District. H. I. Reynolds is the superintendent and employs 35 men. Operations are through tunnels having reached a length of 900 and 700 feet. A tram has been constructed which conveys the ore a distance of 2400 feet to the mill, which was constructed during the year. This mill has a capacity of 200 tons per day. The ore is an iron oxide in character, carrying gold. The property has been repaired and put in shape for extensive operations.

The Shaughnessy.

The Shaughnessy Hill Group of mines are situated on Granite Creek eight miles South of Libby and are operated by A. J. McCorkle and John Town, the former being the superintendent. The operations are by a series of tunnels having reached a length of 700 feet of which 300 feet was accomplished during the year. The ore is a silver lead, in character. Several car loads have been shipped during the year. The property is in a fairly safe condition.

Montana Morning.

This property is situated seven miles South of Troy and is operated by the Montana Morning Mining Company. Operations are conducted through a series of tunnels having reached a length of 700 feet on the vein uncovering several deposits of shipping ore of a lead silver character. A shaft has been put down from the surface which will be tapped by the tunnel

for ventilation and escape. The lower tunnel will be extended a length of one thousand feet. The company has under construction a power plant for electric purposes which will be used in the mine and mill in the near future. The property is under the management of W. R. Biggs, employing 25 men.

The Silver Tip.

The Silver Tip group of mines is situated on Grouse Mountain some eight miles South of Troy and has been developed by a tunnel which has reached a length of 600 feet on the vein. A shaft has been put down 150 feet below the tunnel level to ascertain the continuity of the ore body. The property has been extensively developed during the year, 500 feet having been accomplished.

Victoria Mine.

This group of claims are located in the Sylvanite District 24 miles North of Troy on the Yahk River and is owned and operated by Fred Lang who is developing the property by a tunnel that has reached a length of 800 feet. The ore is of a sulphide character carrying copper, gold and silver. Several shipments have been made during the year.

The Carbonate Queen.

This property is situated on Grouse Mountain, eleven miles south of Troy. Its operations are conducted by the Carbonate Queen Mining Company of which Chas. G. Reeder is the superintendent. In developing the property several tunnels were driven for exploring purposes, the longest having reached a length of 700 feet. Several shipments of ore have been made the ore being of a silver lead character. The development has been made secure by timbering.

The Snow Shoe Mine.

This property is owned by the Rustling Mining Company and is known as the Snowshoe Group. The property is situated 20 miles South of Libby. The property has not been in operation during the year, caused by litigation among the stock holders. The mine has been kept unwatered during the entire time. The latest report from the district is that the property will resume in the near future. The 225 ton concentrating plant has been kept in repair for immediate resumption. When in operation 90 men are given employment.

MEAGHER COUNTY.

Much more activity prevailed in most parts of the county in a mining way than in 1909. The old Copperopolis district has been a scene of activity. The Home Copper Mining company is operating a group of claims at Mindin. The Copper State Mining Company, 30 miles North of Martinsdale shows some promising copper discoveries.

The Durant Group.

This property is operated by the Durant Mining and Smelting Company. C. M. Durant is superintendent. The property is situated on Spring Gulch 14 miles from Martinsdale. Development is progressing at the present time. A two compartment shaft has been put down to the depth of 200 feet which was accomplished during the year and all necessary machinery for safety has been installed. Escapes to the surface have been made in case of accident. The mine is well timbered and ventilation is excellent.

The Blue Eyed Nell Mine.

This group of claims is located on the divide between Fergus and Meagher counties. Operations are conducted through a tunnel having reached a length of 400 feet, cutting the vein 300 feet in depth. Considering the amount of development accomplished the mine shows up exceedingly well and made secure by timbers throughout. Sinking below the tunnel level is in progress to attain a much greater depth. The property is owned by Hughs and Slater. The former being the foreman.

The Moonlight Mine.

The Moonlight property is located at the head of Whitestone Creek in the vicinity of Copperopolis. A tunnel 700 feet in length has been driven to develop the vein at a depth of 400 feet. Two hundred feet having been accomplished during the year. The values contained in the vein are copper and silver. The work has been made secure as far as developed. John Weston is the manager.

The Claraton Group.

The Claraton Group owned and operated by Sam Southworth and son is situated twelve miles North of Martinsdale. A two compartment shaft has been sunk on the property to a depth of 300 feet. One hundred feet being accomplished

during the year. A large vein of copper of a concentrating character has been uncovered in developing the vein. On the various levels the work has been done in a safe manner. Sam Southworth is general manager.

Home Copper Mining Company.

This Company operated under a working bond. It owns a group of copper bearing claims at Minden and did a large amount of development, sinking a shaft 330 feet and drifting several hundred feet on the vein. Recently a very heavy flow of water was encountered which I am advised necessitated a temporary shutdown.

The Copper State Mine.

The Copper State Mining company is operating a group of claims 30 miles North of Martinsdale on the north side of Smith River. The property has been developed by a two compartment shaft that has reached a depth of 200 feet during the year. Development has been steadily going on to ascertain the extent and values of the ore bodies. In the near future the shaft will be sunk to the 500 foot level, in which extensive mining will be carried on. The equipment used at present will be replaced for a more substantial plant which is to be installed in the near future. The values contained are copper and silver which are shown to be of a shipping character. S. W. Wells is the superintendent in charge.

The North Pacific.

This mine is located at Copperopolis and has been operated under a lease during the year. A large amount of development has been done above the water level and some very high grade copper ore has been extracted. Development will be continued further in order to fully test the merits of the vein.

MISSOULA COUNTY.

No region in this or any of the other mining states offers to the prospector and miner and capitalist a field where the prospects for success are any better than those to be found in the region traversed by the Couer d'Alene branch of the Northern Pacific. Development has been carried on very extensively during the present year uncovering some very extensive ore bodies.

The B. A. & P. Mine.

This group consists of fourteen claims which are situated

three miles West of Saltese and operations are conducted by Hall Lusk and Company. The development consists of a tunnel 400 feet long which was extended during the year and will be continued until the 800 foot mark has been reached. The vein carries sulphides showing silver and copper of commercial value.

The True Fissure.

This property is operated by the True Fissure Mining Company. The operations consist of a tunnel which has been driven a length of 2000 feet for exploration purposes cutting the formation. The development has been continuous during the year cutting several veins showing very extensive ore bodies of a shipping character. William Trentesaky is the superintendent in charge. Eight men are employed.

Mountain Meadow.

The Mountain Meadow Group has been under development during the year by the Mountain Meadow Mining Company. The development consists of a 400 foot tunnel which has been driven cross the country which will tap the vein at a depth of 300 feet. This is the nature of exploration work. There are eight men employed. Charles Butts is the superintendent.

The Triangle Mine.

The property of the Triangle Mining and Developing Company is developed through a tunnel which has been extended on the strike of the vein a length of 500 feet which has an easterly and westerly strike. A cross-cut has been driven cutting the granite formation a distance of 300 feet, cutting a well defined vein in the face. An air compressor has been installed which furnishes power to operate the drills used in developing. The formation is very hard and is easily made secure. R. B. Hughs is the manager and employs 15 men.

The Iron Mountain.

This property is located northwest of Superior. The property is operated by the Iron Mountain Mining Company. A tunnel has been driven a length of 5,600 feet which cut the old work shaft 1,700 feet in depth. The time occupied in driving this tunnel was less than two years. The shaft has been extended 200 feet below the tunnel level giving 1,800 feet of depth. The country has been developed and the ore bodies have been opened showing very extensively on the strike. The

company has overhauled the present concentrator with a view to reducing the mine output, having a capacity of 200 tons. The ore will be gravitated from the mine to the mill by the use of tram cars. The ore is a sulphide carrying high lead values. The equipment consists of an air compressor and Ledgerwood hoist, size 10x12, installed under ground, the power being compressed air. The property has been developed extensively during the year. Robert Davis is superintendent and J. C. Daily foreman. There are 40 men employed.

The Ben Hur Group.

This group of claims is operated by the Ben Hur Mining Company and is situated five miles north of Saltese. It is operated by a tunnel that has been driven which taps the vein 500 feet in depth, the length being 1,400 feet, 500 feet of which was accomplished during the year. Development has uncovered some very extensive ore bodies of a shipping character carrying lead and silver, showing a true fissure vein cutting slate and quartzite formation. Development has been continuous during the year, giving employment to 14 men under the supervision of Joseph Laundry.

Gold Crown Mine.

The property operated by the Gold Crown Mining Company is situated three and a half miles south of Deborgia. The property has been repaired and extensively developed by tunnels, which have reached a length of 250 and 400 feet respectively. Connections have been made furnishing ventilation and exit in case of necessity. The old mill has been repaired and increased to a capacity of 200 tons. The ore is an oxide of iron and its values are principally gold. The vein is very extensive. The property has been under the supervision of H. L. Berkly, employing 30 men.

Last Chance.

The Last Chance property is situated in the Saltese district. The property has been developed to the extent of 600 feet through a tunnel, uncovering valuable ore bodies of a shipping character. Development is far ahead of ore extraction. George Champlain is the manager, employing six men.

The Hemlock.

The Hemlock property has been opened by a tunnel that has reached a length of 500 feet on the strike of the vein.

showing some very extensive ore bodies containing lead and silver values, mostly of a concentrating character. They are awaiting the erection of a proper plant. The property is owned by John Morrisy. Six men are employed in the development.

The Bryan Mine.

This property has been operated under bond by the Hercules Mining Company under the management of Hugh Ross. The property has received extensive development during the year, the main tunnel having been driven a length of 1,100 feet. The work will be continued until the 1,200-foot mark has been reached, a point to intersect the vein. The values contained are silver and lead showing some copper in the vein. Twelve men are employed in the development.

Hidden Treasure.

This property is situated three miles north of Clinton on the Northern Pacific railroad. The mine is opened by two tunnels 550 and 1,500 feet respectively, which are connected by an upraise affording means of escape and ventilation. The management has developed the property extensively, exposing very extensive ore bodies carrying gold and copper. The property is owned by C. A. Stephens of Missoula.

The Buffalo Mine.

This property is operated through a series of tunnels of 700 and 800 feet on the vein. The property has been very extensively developed during the year. The property was found in fair condition. The character of the ore is sulphide carrying gold and a small percentage of copper. Regular shipments are made. The property is under the management of Patrick Conroy, who employs 12 men.

MADISON COUNTY.

The precious metal output is being considerably increased and the number of producing mines is increasing as well as the number of men employed. The future growth is assured by undeveloped and meritorious prospects that are found in all parts of the county. The Virginia City and the Twin Bridges are coming to the front and show permanent as far as developed.

The Bismark Mine.

The Bismark Mining Company is developing a group of

four claims in the Mammoth district south of Jefferson Island. Operations are by a tunnel that has reached a length of 850 feet. Several large ore bodies of a concentrating character have been developed, containing copper and silver values. Eight men are employed in the development.

The Clipper Mine.

This group of claims is situated three miles west of Pony near the summit of the Tobacco Root range. The property is operated at present by Wilkey and Smith Leasing Company. W. H. Wilkey is superintendent in charge of the mine development. The property is worked through an adit tunnel, it having reached a length of 2,600 feet. The ore bodies are very extensive, being sulphide in character. The principal values contained being gold. The product is treated in a mill constructed by the company at the mine with a capacity of 50 tons. The mill is equipped with Overstrom tables and van-ners, perfecting a great saving on the plates. The mine and mill are run by electric power throughout.

The Ruby C Mine.

This property is located in Gold Canyon 12 miles east of Twin Bridges. The group has been bonded to W. E. Howell, who is acting manager. He has leased the property to develop on a royalty basis. The property at present is in a prospective stage of development. A 200-foot shaft has been sunk and drifting on the vein to the extent of 300 feet has been done. The property is equipped with a steam hoist and safety appliances.

The Lehigh Mine.

The Lehigh is a very promising property. It is situated in Meadow Gulch, and is owned by Hugh Elliot. The vein has been developed to a depth of 115 feet by an incline shaft. It is drifted on for a length of 650 feet, several hundred feet having been accomplished during the year. The development work now being conducted is the extension of a tunnel that will secure a vertical depth of 300 feet. The ore is free mill-ing gold in character.

The Copperopolis Mine.

Operations are carried on through an adit tunnel, it having reached a length of 500 feet, exposing the ore for a distance of 200 feet in length. The ore is a sulphide in character. The

values are gold. Connections have been made to the surface for ventilation and escape in case of an emergency. The property is under the management of H. J. Kelly.

Empire Exploration Company.

The property owned by this company is situated in Gold Canyon, ten miles east of Twin Bridges. The company is driving several tunnels to develop the group, having reached a length of 150 and 100 feet respectively on the vein, carrying silver and gold and lead values. The property is under the supervision of H. Strausberger.

The Moonlight Group.

This property has been operated under bond to Higgins and Company during the year. The property is situated in Bear Gulch. Operations are through several tunnels that have been driven which have intersected the ore bodies, which are of a shipping ore of concentrating character, as the veins are very extensive, showing large bodies of commercial ore. A small plant has been erected to test the machinery required to effect the greatest saving. The values are gold and copper.

Royal Bear.

This property is located in Bear Gulch, ten miles east of Twin Bridges. Operations are conducted through a tunnel 200 feet in length cutting the formation. The work is being done for exploration purposes to prove the values contained in the district. There are six men employed. B. H. Paige is foreman.

Grand View Mining Company.

This property is located in the Tobacco Root range of mountains, 12 miles east of Twin Bridges. A tunnel has been driven for the purpose of developing the property a length of 300 feet, cutting the vein at a depth of 200 feet, encountering several ore chutes from which ore has been mined, showing high values in gold. Henry Smith is in charge of the property.

The New Mine.

This property is operated by the Rochester Mining Company in the Rochester Mining District of which James Miller is in charge of the operations. The property has been developed by an incline shaft that has reached a depth of 300 feet, 100 feet having been added during the year. The vein has been opened

to the extent of 560 feet. Several shipments of ore have been made which carry values in gold.

Winnetaka Mine.

This claim is owned by Ball and McGrath & Company and is located 4 miles South of Virginia City. A tunnel is being driven on the vein a length of 300 feet and an upraise made to the surface. The mineralization of the vein is becoming better as the tunnel is extended into the mountain. The vein shows permanency and carries high values in gold.

Lake Shore Mining Company.

The properties of this company consist of seven adjoining claims situated at the head of Wisconsin Creek, fifteen miles from Sheridan and near the summit of the Tobacco Root Range at an elevation of approximately 9000 feet. This property has been developed during the year. Two parallel tunnels are driven and are respectively 450 and 125 feet in length. These cross cut two gold bearing veins which are drifted on in the aggregate, 500 feet. Twelve men are employed under the supervision of Ben Thompson.

The Apex Mine.

The Apex property is located in the near vicinity of the Kearsarge mine and is operated under a lease by the Apex Mining company, employing 26 men under the supervision of R. J. Williams. A tunnel has been driven cutting the formation a length of 200 feet. A shaft has been put down to a depth of 100 feet below the lowest working to ascertain the extent of the ore body which has been extracted in the upper portion of the mine, carrying very high grade values in gold. A mill is in course of construction for the reduction of the mine output which will be electrically driven.

Pacific Group.

This group is owned by the Elling Estate and is situated about 8 miles from Virginia City. J. H. Pankey is Superintendent. The property is developed by two tunnels 1400 and 2600 feet in length respectively. The property has been extensively developed during the past year, a shaft having been put down one hundred feet below the lowest workings to determine the extent of the ore bodies. The ore yield gold and silver. Part of the product is shipped for reduction and

the less valuable grades are treated in a 30 ton mill operated in connection with the property.

The Strawberry Mine.

This mine has been worked intermittently for many years and a large tonnage of ore in the aggregate has been shipped from the immediate vicinity. It is developed by crosscut tunnels, the lower or main working tunnel being 1300 feet long. An upraise is in course of driving which starts at a point in the main tunnel. The ore mined in the upper portion is conveyed by chutes to the main tunnel and trammed to the mill, which is owned by the company, for the reduction of the mine output. The values contained in the ore are gold and silver with a small percentage of copper. The property is under the management of C. E. Morris and C. E. Drackert, employing 20 men.

The Revenue Mine.

This group of claims is located six miles South of Norris on what is locally known as Richmond flats. The property is owned by the Montana Revenue Gold Mining Company, which has been operated under the leasing system during the past two years and work has been confined to the extraction of ore from the upper portion of the property. The ore is treated in the cyanide plant which is owned by the Company.

The Silver Bell Mine.

This group consists of seven claims South of Virginia City. Operations are conducted through a series of tunnels which have reached a length of 300 and 700 feet respectively, showing a well defined ore body carrying silver and gold as the principal values. The vein is cut 400 feet in depth showing a well defined fissure on the strike. The work is done under the management of William Clancy.

The Union Miné.

The Hecla Mining Company is developing a group of twelve claims in the Cottonwood District five miles South of Norris. The early development was by shaft. To eliminate the handling of water, a tunnel has been driven which when completed will be 2000 feet in length. The tunnel is a crosscut and has cut several veins known to exist in the group. Five hundred feet had been accomplished at the time of inspection. The values contained are silver and copper.

The Highup Mine.

The Highup property is located seven miles South of Virginia City and is owned by E. W. Merritt, acting superintendent in charge of the development. The property has been opened by a tunnel 600 feet in length which will be extended to a length of 1000 feet, cutting the vein at a point 500 feet in depth. Several large ore bodies of a concentrating character have been explored in the workings. The property has been closed temporarily, pending the erecting of a concentrating plant for the reduction of the ore.

The McKee Mine.

This group of claims is located at the head of Meadow Creek and is operated by Asker Lennon, who acts as superintendent. The property is worked through several tunnels varying in length from 500, 300 and 250 feet, on the veins. A twenty-five ton mill has been erected by the management for the reduction of the mine output. The values are principally gold.

The Hudson Mine.

The Hudson Mine located at Silver Star is owned by Charles Dahler. It has been very successfully operated during the greater part of 1909, 1910 by leasers. The mine produced a gold ore which has netted a handsome profit per ton to the operators and the bodies developed yielded a large monthly tonnage during the year. The incline shaft was lowered to the 350 foot level and extensive development done in opening up the vein.

The Bowery Mine.

This old property was operated almost steadily the past two years by a party of leasers. The mine is located near Silver Star and is one of the very early locations in this section of the state. At no time has justice been done the property, as it has been operated intermitently by leasers for many years, whose chief aim was to extract all the ore possible with the least cost and expend as little labor on development as conditions imperatively required, usually neglecting to timber the workings or make provisions for the future of the mine. The shaft has been sunk 100 feet giving a total depth on the angle of the vein of 650 feet. The property is equipped with a steam hoist.

The Prospect Mine.

This property is located in the district near Virginia City and is operated by the Pankey Brothers. P. S. Pankey is superintendent. Electric machinery has been installed for the power. An Ingersoll compressor has been installed to furnish the air for hoisting and drilling purposes in the mine. A tunnel 1400 feet long has been driven at intervals on the vein and it has been connected with the surface workings for exits and ventilation. The work done has been made secure for the twenty men employed.

The Tucker Mine.

This property is operated by Tucker and Hatchfield who are the owners. The group is located on the divide between Meadow Gulch and Deer Creek. The property has been opened by a cross cut tunnel 250 feet in length, where the vein was cut and ore extraction has been made, a distance of 100 feet on the vein East. The principal values are gold. The property is in good condition.

The Lester Group.

This group of claims is located ten miles East of Twin Bridges. Operations are conducted through a series of tunnels driven on the vein. The ore is a sulphide in character carrying copper and gold values. The property has been receiving a thorough exploring during the year, opening several commercial ore bodies. Regular shipments are made to custom smelters.

The Realty Gold Mining Company.

This Company is developing the Bozeman group of claims situated on the divide between Pony and Mammoth. The property has been operated by a series of tunnels, ranging in length from 100 to 700 feet respectively. The upper and surface tunnels are used to convey the ore to the lower workings where it is conveyed to a bin, loaded in an aerial tram which conveys it to the mill a distance of 4000 feet. The mill has reached a capacity of 100 tons. A cyaniding plant of like capacity has been built in connection with the property. The property has been developed very extensively during the year, under the management of H. Dickenson and W. C. Benson the foreman, employing 60 men.

The Easton Mine.

This is owned by the Elling estate and is situated eight miles from Virginia City, and is under the supervision of J. H. Pankey. The property has been in constant operation during the year employing a large force of men, equipping the entire plant with electricity. A 30 ton cyanide plant has been erected for the treatment of the tailings which have accumulated, the years the mill has operated on Easton and Pacific ores.

PARK COUNTY.

Though development has been continuous mining was not as active as in former years. In the Jardine district owing to litigation among the stockholders of the Kimberly Gold Mining Company, mining has not been as actively engaged in as formerly. Various strikes have been made on the Tungston veins and wide interest has been aroused in the camp. With transportation facilities the Cook City district will compare in production with the older organized sections of the country.

The Yellow Jacket Claim.

The Yellow Jacket property is situated in the Cook City district and is owned and operated by James Hall. A tunnel has been driven on the strike a length of 400 feet showing a well defined lead carrying silver and lead values of a concentrating character. The development has been continuous during the year.

The Crevasse Mine.

This group of mines is located in the Jardine district and is owned by W. G. Conrad and has been operated under lease by E. L. Wiss. The mine is developed with a 1200 foot tunnel and a perpendicular shaft which has reached a depth of 200 feet. The mine is equipped with a steam hoist. Openings have been made to the various workings for ventilation and escape. The ore is an iron oxide carrying gold as its chief value. A twenty stamp mill is located near the main working which treats the mines output.

The Daisy Mine.

This property is developed by a main tunnel 700 feet in length besides the other tunnels higher on the lead. The vein shows from three to four feet of ore which carries high values in lead and silver. The property has been developed by the Bliss Mining Company.

The Tiger Claim.

The Tiger Claim is operated by the Cobalt Mining Company under the supervision of Gus Holm. Operations are conducted through a tunnel that has reached a length of six hundred feet opening up several bodies of ore containing silver and lead values. In the course of development the works have been extended 300 feet during the year, employing six men.

The Goose Lake Copper Company.

The Copper King group is operated through a tunnel which has been driven on the strike a distance of 250 feet under the management of John Martin. Some very high grade ore has been cut during the development carrying copper and silver as the principal values.

The King and Queen Mine.

During 1909 a cross cut tunnel was run to a length of 300 feet to the lead on the King and Queen mine owned by the Copper King Mining Company. This mine is situated North of Cook city. The tunnel tapped the vein at a depth of 100 feet and a level extended West 150 feet. The ore yields a fair value in gold.

The Reward Mine.

The New World Mining and Developing Company is exploring a group of claims through a series of tunnels, the longest having reached a length of 700 feet, cutting a well defined vein which carries gold and copper. The property has been developed very extensively during the year.

The Young Bonanza.

The Young Bonanza mine is owned and operated by P. A. Bell and Bros. The vein is developed through a tunnel 300 feet in length tapping the lead at a depth of 400 feet from the point of intersection. A drift has been driven on the vein 300 feet, showing a well defined lead carrying gold and silver. The property is five miles North of Cook City.

The Republic Mine.

The Republic mine is operated by the Buffalo Montana Mining Company. The property has been developed by tunnels that have been driven on the vein a length of 300 and 500 feet which extend through several extensive ore bodies. This property has been operated at intervals during the past two years owing to the low price of the metals and owing to the long

distance of transportation. The mine when in operation employs thirty men, under the management of N. J. Tredinnick. The ore is of a silver lead character which is treated in the smelter owned by the company.

POWELL COUNTY.

Some of the best mining opportunities in any district of the state are to be found in the several mining districts in the upper Ophir and Snowshoe districts. Several promising gold and copper properties were developed and tests made in a small way of properties near Helmsville and Ovando and on the Little Blackfoot, which encourages the belief that producing mines will be developed. A concentrating plant has been installed on the Little Blackfoot.

The Julia Mine.

This property has been taken over by the Montana Clinton Copper Mining Company of which C. L. Fredricks is manager and R. K. Jones the superintendent. Fourteen men are employed in the operations which are conducted through a tunnel 400 feet in length. A shaft has been put down 75 feet below the lowest working and ore has been extracted from that depth. A gasoline hoist is used in the operation. The vein shows permanency as far as developed, carrying silver and lead values. All precautions have been taken to avoid accidents.

The Keno Mining Group.

The Keno Mining Company is developing the group of claims located on the Little Blackfoot, 4 miles south of Elliston. A tunnel 900 feet long has been driven on the vein showing some very extensive ore bodies of a concentrating character. A concentrating mill has been constructed having a capacity of 50 tons a day on the property. During the year a cross cut tunnel was in course of construction to cut the vein at a much greater depth, conveying the ore from the mine to the mill by the tram system. This makes a very cheap cost of transportation, connection being made to the upper portion of the mine which has been made secure by timbers. Twelve men are employed.

The Band B.

The Band B property has been developed by the owner J. P. Brusezite by extending a tunnel a distance of 350 feet, opening

a well defined ore body carrying free gold, showing permanency as far as developed. The tunnel is made secure by timbers. Several shipments have been made.

The Flagstaff Mine.

This property is located on Snowshoe Creek, ten miles North of Elliston. The property is owned and operated by the Elliston Copper Mining Company, under the management of William M. Rowlings. A series of tunnels have been driven on the property ranging in length from 200 to 450 feet respectively. All provisions being made for the protection of the men employed. The formation of the country is lime. The ore making in large deposits containing copper and gold.

The Monarch Mine.

The Lynis Copper Mining Company is developing a very promising group of claims situated 14 miles south of Elliston. A tunnel has been extended a length of 1400 feet, opening some very extensive ore bodies showing silver, copper and gold of a shipping character. An exit to the surface has been made for safety and ventilation. The property is under the management of Charles L. Fredricks.

The Fair View Mine.

The property is operated by the Fair View Mining Company and is situated at Ophir, nine miles North of Avon. A shaft has been sunk by the Company during 1909. The veins are developed extensively, several hundred feet being accomplished. Several large ore deposits have been exposed and regular shipments were made. Operations ceased during the year for a short period. The shaft has been provided with a steam hoist and safety cage. Several exits are maintained which supply good air and means of escape, in case of emergency. F. L. Sizer is the manager and George Redding the foreman. Twelve men are employed.

The Little Dandy Mine.

This group of eleven claims is located five miles Southeast of Garnet and is operated by the Ohio Developing Company of which E. H. McDonald is the manager and M. J. Sullivan the foreman. The development consists of a series of tunnels ranging in length of 700 and 1000 feet on the vein. Connections are made between the various tunnels for ventilation and escape. The vertical depth is 500 feet. Developing the vein

has been carried on extensively during the year. Several extensive ore bodies have been discovered in a well defined fissure vein. Twelve men are employed.

The Penmont Mine.

The Penmont is situated three miles south of Elliston and is operated by the Penmont Mining company. Thomas Rodgers is superintendent. The work being done is conducted through tunnels that have reached a length of 300 and 150 feet, on the vein carrying lead and silver. The work has been timbered and made secure as far as developed.

The Mammoth Mine.

This group of claims is situated in the Colma Mining District and is operated by the New York Mining Company. A. L. Barber is the Superintendent. Operations are carried on through a series of tunnels. A tunnel in course of construction lower down the mountain is to be extended to a length of 2000 feet from which ore will be conveyed to the mill by gravity which will effect a great saving in the transporting of the output. The ore produced is a sulphide carrying gold as the principal value. The property as far as developed is in a fair condition.

The Birdseye Mine.

The Birdseye Mine is situated up Chicken Creek and is operated by a crosscut tunnel which has been driven a length or 300 feet at which point the vein has been cut, driving on the vein to the extent of 300 feet, where ore extraction has been done. A five stamp mill has been installed for a test to determine the process to be installed later for the greater saving of the values which are principally gold. The property is operated by William Finn of Helena.

RAVALLI COUNTY.

Much attention has been attracted in several of the districts in the Bitter Root Range and development has been prosecuted in them with satisfactory results. The metalliferous veins afford the most attractive possibilities for developing large producing mines of a concentrating character.

The Ore Finder Mine.

The Ore Finder group is located five miles South of Victor and is operated by the Ore Finder Mining Company of which John Hickey is the manager. The property has been devel-

oped to a depth of 200 feet by a perpendicular shaft of two compartments and from which 400 feet of drifting has been done revealing ore bodies carrying gold, silver and copper values. The workings are equipped with a steam hoisting plant.

The Curlew Mine.

The Curlew group consists of seven adjoining claims situated four miles Northwest of Victor and owned by A. M. Holter. Thomas Cowan is the Superintendent. The property is developed through a 300 foot perpendicular shaft. The equipments consist of a steam hoist. It is intended to sink the shaft an additional 300 feet from which depth extensive development will be done on the strike of the vein from the attained levels, the output of the mine being treated in the 100 ton concentrator that is conveniently located on the property.

SANDERS COUNTY.

Mining in Sanders County has been very active during the past two years. The Standard district South of Thompson Falls has been especially active, a number of tunnels having been driven for development a length of 2000 feet. The districts surrounding Eddy and Carter have shown great activity. Some very promising veins have been developed in the great mineral zone stretching over the mountains to the Idaho line. The mineral possibilities of Sanders County are great and development will be made with the practical assurance of success.

The Golden Eagle.

The Golden Eagle Group of claims is situated in the Carter district. A tunnel 400 feet has been driven on the strike showing a very extensive ore body. Several car loads have been shipped. The property will be developed extensively during the next year under the management of Wm. Hutchan.

Hamilton-Montana Mine.

The property of the Hamilton-Montana Gold Mining Company is located in the Carter district. Operations are being conducted through a tunnel which has been driven a distance of 300 feet, croscutting the formation. The ore body will be cut 700 feet in depth. The principal values contained are copper, silver and lead. The property is under the supervision of Richard Daxon, employing 7 men in the development work.

Iron Mask.

The Iron Mask Copper, Silver Mining Company is operating in the Carter district on a group of seven claims. The work of developing the property has been extensive during 1909 and 1910. Twenty-four hundred feet has been accomplished, cutting several veins of a concentrating character carrying lead and silver and a small percentage of copper. The property has been under the management of J. B. Hunter, employing 10 men.

The O. R. & N. Mine.

The property of the Couer d'Alene Independent Consolidated Mining Company is situated at Carter. C. Povleg is the general manager and Antona Tameitti is foreman. Operations are conducted through a tunnel that has been driven 1700 feet of which 400 feet has been driven during the year. The country formation is slate and chist, the character of the ore being a sulphide copper silver and lead.

The Glen Metal Mines.

The Glen Metal Mines are situated in the Carter district and are operated by the Glen Metal Mining Company. The claims have been opened through a tunnel that has reached a length of 2200 feet cutting the formation which is principally slate, the strike being East and West showing well defined veins. The tunnel will be extended until the 3000 foot mark has been reached to ascertain the values contained in the several veins known to exist. The property is under the management of W. M. Bryan.

The Standard Mine.

The Standard Mining Company operating eleven miles South of Thompson Falls is developed principally through a 1900 foot cross cut tunnel that intersects the vein at a depth of 900 feet. The group is traversed by several fissure veins that are well defined. The lead has been opened from the point of intersection, opening some good bodies of shipping ore of a silver-lead character. During the year the main tunnel has been extended 500 feet making the entire length 2400 feet. The property has been equipped with a Lyner Compressor. Water power is used for ventilation purposes. Freeman Rowe is manager and W. L. Mahoney foreman.

The Broken Hill.

This property is situated nine miles West of Iron Mountain

in the district between Sanders and Missoula counties. The operations have been carried on through several tunnels. The lower tunnels having reached a length of 450 and 700 feet. Connections have been made between the various workings which affords ventilation and exit to the surface. The character of the ore is oxide of iron, carrying as much as 80 per cent excess of iron, which is very much sought for fluxing purposes. The property is well ventilated and the timbering is perfect.

The Copper Bell Mine.

The property of the St. Regis Mining Company is located eleven miles Northeast of St. Regis and is operated by tunnels having a length of 600 and 800 feet respectively. These cut the formation for that length. The veins have been opened up East and West a distance of 500 feet exposing several large ore bodies. The principal values are copper and gold. The country formation is quartzite and chist. The property as far as developed is kept in good condition with regard to safety. Peter Stroble is manager.

The King and Queen Mines.

The King and Queen Mines are located in the Carter Mining district and have been operated under a lease to C. B. McKennon. The extraction of ore has been steadily progressing, several carloads having been shipped, carrying very high values in copper and silver. The property is developed with a tunnel 1200 feet in length. This intersects the vein at considerable depth. At the point of intersection a winze has been put down 200 feet and ore extraction is in progress. Twelve men are employed in the mines.

REPORT OF DEPUTY STATE MINE INSPECTOR.

Butte, Montana, December 1, 1910.

William Walsh,
State Mine Inspector,
Helena, Montana.

Dear Sir—I herewith submit for your approval my report of mines examined together with list of the fatal and non-fatal accidents, for the fiscal years ending November 30th, 1909 and 1910 respectively.

Respectfully yours,
W. B. OREM
Deputy State Mine Inspector

Although a low price of metals and a general depression in mining circles has prevailed, for the year 1910, still the mines in Butte have produced their usual output of former years. Development work was suspended in most of the new companies with the exception of a few, which, within the last year have become producers thereby enlarging the mining district, and encouraging other development companies which are in the same locality. The general condition of things seems to be improving, and it is hoped that conditions will so shape themselves that a great many of the companies will resume. Many of them have reached the stage of development, which, with an additional depth of one or two hundred feet, shaft sinking and the necessary drifting and cross-cutting, may put them in the list of producers.

The last year has made some wonderful developments in the large properties at the lower levels, showing a continuation of ore bodies, and the values are still maintained; so there is no question of the future of the camp. Mines which were supposed to have been worked out have larger ore reserves than they ever had.

Mines that were prospected up until last year, and now numbered among the producers are the Black Rock, Davis-Daly, Tuolomne and Badger.

With some of the new producers comes a new character of ore, containing most of its values in zinc. Large zinc deposits are being developed in the northern part of this district; and also in the southern, which will give more employment to men. Some of the ore carried lead and iron, which is necessary for

furnace treatment. Others not carrying these metals have been concentrated. Clark has installed a plant for the treatment of zinc ore in the Elm Orlu, giving good results. The Black Rock people have completed a foundation for a large concentrator, for the treatment of zinc ore; but at the present time their ore is treated at the Basin concentrator.

The general method of mining in the Butte district is up to the standard. The greatest matter to be considered in great depths is the matter of proper ventilation. Recently the subject received considerable consideration by the management of large properties. Within the next two years there will be a wonderful change in the ventilation of the mines in the Butte district.

Having the pleasure of visiting some of the mining camps in Michigan this year, I had the opportunity of investigating the method of ventilation. The conditions in the Michigan mines are a great deal different from the mines of Montana. In the first place, their character of rock is much harder, and not requiring filling and timbering like that used in the mines here. Of course, everybody knows where filling is used it has a tendency to make the air much warmer, the consequences are that they don't have this to contend with; and instead of working from the 200 to the 2000 on nearly every level, they only work 200 or 300 feet at a time; giving them an ample show to ventilate the amount of ground opened. If we had the same conditions here, we would have better air than they have.

I also found portions of their mines that were not in the direct circulation of air between their shafts, were warmer than a great many places in our mines.

From my observation in the different mines, I am of the opinion that the correct way of getting good air into mines, is by air shafts, separate entirely from hoisting shaft, keeping these air connections as deep as the main working shaft. You have two separate workings to the bottom level, which will secure circulation that cannot be secured by any other means. The shaft that is an outlet should have a larger dimension than the one that is an inlet, because the air often becoming warm requires more space, and consequently it is harder to get into circulation. Anyone familiar with the workings of a mine knows it is impossible to ventilate a mine if the

shaft is 2100 feet deep, and the air shaft 1600. It is impossible to secure circulation to the bottom of the mine. If the air shafts are kept within any reasonable depth of the working shafts proper equipment there would be a great change in the matter of ventilation. Where air shafts are carried down from the surface, and workings with the connections made in other mines, gives circulation of pure air. When two shafts are sunk or raised to a common depth, as a consequence one of them will be an upcast, but various mines, where connections are made by means of air and development shafts to the lowest level, the ventilation is all that could be expected. I believe every mine should have its own air shaft, and not depend upon connections with other mines. These shafts should be used for air only. Air shafts should be sunk or raised in solid ground, away from mine workings, and connections made with air shafts by cross-cuts. By placing doors on the cross-cuts, it is possible to convey air to any part of the mine. In some instances connections are made with other mine workings, as far as ventilation is concerned, and is a detriment rather than a benefit; as the air so receiving may have become impure for the use in other workings, while it appears to be good air it is not. The effect is soon noticed by men working. Connections with other properties are necessary for the safety of the men. While most of the mines have separate escapement shafts, it is not always possible to have them located so they are out of danger. These connections are considered detrimental to the property. The connections can be closed by a door to be used in case of necessity. All companies realize that it is impossible to get the same amount of work out of men when the air is poor. So it is to their advantage to secure the best possible ventilation.

The cost of making proper air connections is soon made up in labor. I recommend the cars now in use in the High Ore mine, in regard to sanitary conditions, doing away with the stench that comes from the use of stopes and drifts used for that purpose by the men. It is a great help in keeping the air pure. These cars have been in use in this mine for several months and have given good satisfaction and I believe they should be installed in all the mines.

The large companies are installing electric fans in many of the air shafts with good results. The Rarus has a Buffalo fan

installed at its air shaft which has four compartments to the sixteen hundred. This fan has a capacity of 180,000 feet of cubic air per minute, and is giving wonderful results. They also have one at the Cora shaft, which is doing good work for the Diamond and East Grey Rock, having a capacity of 180,000 cubic feet of air per minute. This fan has reduced the cost of mining in the Grey Rock 35 cents per ton. A short time ago this mine was considered one of the hottest mines in the camp; but by the use of this fan and the connections with the West Grey Rock, it has become a very cool mine.

The Pennsylvania has a fan located at the 1200 air shaft pulling down the shaft. The drift connecting with this fan is 7½ feet high, 5 feet wide, drawing 50,000 cubic feet of air per minute which is conveyed through the raises to various places in the mine, the air coming out of the working shaft.

Cambetta No. 1 and No. 2 have fans handling 30,000 cubic feet of air per minute, and have a capacity of 60,000 cubic feet. They have installed a large one at the Green Mountain, Gagnon air shaft. The Original has also installed one, and the East Steward, and the Parnell. The Tramway mine has just installed a large fan on their 1700 foot level for the purpose of ventilating the mine.

Nearly all of the mines are installing fans in all the air shafts. These fans are so constructed that they can be either made to force air into a mine or take it out.

A great boon to the mining industry is the cheap power now afforded by the development of the water power of the state, which is used to generate electric power. The plants of the Missouri River Lower Company, and the Helena Power Company, on the Missouri River near Helena, and the Plant of the Madison and Big Hole River. The largest of all is the plant at Great Falls completed this year, which will furnish all power for mining and smelting operations and encourage development of properties where steam power would be impossible. Electric power is used in nearly all of the Butte mines, and is used for pumping, hoisting and compressor plants. It is a great help in ventilation in underground workings doing away with the heat caused by steam pumping.

Butte Hoist and Compressor Plant.

The plant consists of three electric driven cross compound Norberg variable capacity compressors, 15x30" cylinders of

75,000 cubic feet of air per minute. Capacity each, aggregating 22,500 cubic feet per minute. These compressors being direct driven by 1200 horse-power motors of synchronous type, built by the Westinghouse company; 24 air receivers 10 feet diameter by 30 feet high will be used for storage. These receivers aggregate 56,548 cubic feet, which, at 90 pounds pressure, is equal to 480,000 cubic feet of air at this elevation of Butte. In addition to these 10 receivers, 10 feet in diameter, by 56 feet 8 inches long, will be used in connection with the steel tank 100 feet in diameter by 10 feet deep for storage and hydrostatic pressure. This tank has a capacity of 500,000 gallons of water, and is connected with the receiver by a 42 in. pipe. It is located at an elevation of 208 feet above the receivers, giving a pressure of 90 lbs. If more air is drawn from the receiver than the compressors can supply, the water will flow into the receiver, keeping the pressure up to 90 lbs., as long as there is any water in the tank. It is intended to use this compressor plant for the Mountain View, High Ore and Diamond hoisting engine, and at each mine a 50-horse power reheating boiler will be located, which will be operated under the pressure of 200 pounds of steam. At this pressure with a temperature of 387 O. F., will circulate through a sectional surface heater of special design, 50 in. in diameter and 25 feet high, located near the hoist. The air before going to the engine will be heated 350°F.

This method is for the purpose of doing away with steam for hoisting engines and using compressed air instead.

Pickling Plant.

The pickling plant is for the purpose of increasing the life of timber two or three times its natural life. It has a capacity of 140 railroad ties at one charge, or 7000 feet of lumber requires from 12 to 14 hours. The truck is 45 feet long, and five feet wide, which is run into this tank. A charge consists of three hours under steam, one hour under vacuum, 9 hours of creosote, 1 hour draining, then heated with steam and drawn off and added hot creosote 240°F, and at 100 lbs. pressure, 9 to 10 hours, one quarter to one half hour after cooling off continues to penetrate the timber.

The ore from the Anaconda property is shipped to Great Falls and Anaconda, about 3500 tons are shipped to Great Falls. The ores from the Amalgamated properties and the

North Butte, Red Metal, Davis-Daly and Tuolomne are shipped to the Washoe smelter at Anaconda where approximately 10,000 tons are treated daily. Ore from the West Butte is treated at their own smelter, amounting to about 225 tons per day.

Safety Devices.

The crosshead invented by Mr. Bryant is a great improvement over the common crosshead used in this camp for years, being the cause of several accidents by hanging up when the miners are riding on the bucket, not noticing it, then coming loose, falling and catching them. The one invented by Mr. Bryant does away with the danger of hanging up, and in the case of rope breaking it not only holds the cross end, but the bucket as well, and also gives the same freedom to the bucket at the bottom of the shaft as was had by the ordinary crosshead. It is constructed on the lines of a skeleton cage, with safety dogs on it, bonnet and deck for men to ride on. The safety dogs are operated from the bottom by hollow pipe which allows the rope to pass through. I do not consider the common crosshead safe, and recommend the new safety crosshead to any operators using crossheads for sinking.

Hoisting Machines.

All the principal mines in this district have installed new safety devices on their hoisting engines, which will prevent the cages from being hoisted into the sheaves. The device works automatically on the brakes, so that when the cage is within 100 feet of the collar of the shaft, going at too high a rate of speed, the brakes are set, stopping the cage within 75 or 100 feet after the device works. The device is very simple, 3 cylinders are set directly behind the brakes with an attachment on the indicator to show the position of the cage in the shaft, when it is close to the surface. Going at a dangerous rate of speed steam is forced into the cylinders which causes the brakes to be set, thereby stopping the cage. In all mines where the device has been installed it has proved successful.

The Anaconda Company for the present year used four million lbs. of powder. We have had several powder accidents but when you consider the vast amount handled it is not to be wondered at. There is more when you realize the danger there is in handling explosives.

The Anaconda Copper Mining Company.

The mines operated by the Anaconda Copper Mining Company during the year 1910, were the Anaconda, Mt. Con, J. I. C., Original, Pauline, Gagnon, Silver Bow, Tramway, Leonard, Badger State, Never Sweat, Bell, Belmont, Stewart, Parrot, East Grey Rock, Berkley, Mountain View, West Colusa, Diamond, St. Lawrence, High Ore, Right Bower, Moonlight, Little Minal, West Grey Rock, Rarus, Pennsylvania, East Colusa.

John D. Ryan, General Manager, John Gillie, General Superintendent, B. H. Dunshee, Assistant Superintendent, J. C. Adams, and Mr. C. W. Goodale, Superintendents. The number of men employed is 7,187 miners, 1763 surface men making a total of 8950.

The Anaconda Mine.

There are 325 miners, 184 surface men employed in this mine. J. P. O'Neill, superintendent. The compartment shaft is down to the depth of 450 feet. Owing to the recent fire a portion of this shaft is caved in and now engaged in re-timbering, getting it in condition to work through. There is electric bell communication with all parts of the workings and all the sills and drifts are lighted with electricity. The mine is timbered with round and square timber, framed into square sets. The system of back filling is used in this mine. The chute is made of round and generally notched timbering and they are known as "log cabin chutes." The system is safe enough when the walls are hard and the ground is generally good. It is necessary, however, to keep this kind of mining filled closely having the stopes well picked down, the backs not too high. Ore can be cheaply extracted and handled under this system, as with no timbers and plenty of room the chutes can be placed together giving the shovelers unobstructed room to work in, and consequently increasing the ore supplies to the chutes. There have been few accidents under this system for the last few years.

This mine is large and requires three foremen, Mr. John Sullivan and Mr. Martin being foremen on the main ledge, Denny Kennedy in the south ledge. The mine is equipped with double deck cages, eight ton skips attached, 32"x72" cylinder, copper valve Corliss engine, built by the Montana Iron Works 1½"x7" flat cable. The skips are loaded from the different levels and hoisted to the surface and dumped automatically into

the ore bins. Most of the ore is hauled from the stopes by horses and motors. Horses worked in the mine are seldom brought to the surface, they remain in fine condition. This mine is fairly ventilated from the connections with the Never Sweat, St. Lawrence south shaft No. 9, and Rose shaft in the South ledge with three or four intermediate shafts to the 1400. This mine has a dry for the accomodation of 600 men, having 32 shower baths. This is one of the most essential things for the men, it allows them to go home clean and dry and it maintains and improves their physical condition.

The Never Sweat Mine.

The Never Sweat Mine is operated under the superintendency of J. P. O'Neill, having 350 miners, 45 top men. The main shaft of the mine is down to 2500 feet. This shaft has three compartments, is fitted with electric bells, and all the levels and drifts are lighted with electricity. Equipment is 32"x72" cylinder Union Iron Works engine, 1½"x7" flat cable, and two double deck cages with 8 ton skips attached. The ore is handled practically in the same manner as the Anaconda mine. The motive power, lighting, etc., is secured from the transmission wires of the different power companies whose generating plants are located at Great Falls and the Missouri River near Helena. The power used for the drills is furnished by five Ingersoll Sargent compressors. This mine is fairly ventilated with the various connections they have with different mines, being connected with the Moonlight, Colusa-Parrot and Parrot. This mine is timbered with round and square timbers, framed into square sets. The system of back filling is also used. The plant of this mine also furnishes the Anaconda, St. Lawrence, Moonlight, West Colusa with air.

The St. Lawrence Mine.

The St. Lawrence mine, J. P. O'Neill, superintendent; Mr. Dan Crowley foreman. There are 450 miners employed, 44 surface men. The ventilation of this mine is excellent having connections with the Mountain View, Pennsylvania, Anaconda, Never Sweat, also the Sweat and Metcalf raise from the surface and the end line shaft. This mine is well timbered and in good condition. It is provided with a dry, which will accomodate 600 men. The working shaft is 2180 feet deep. This shaft is equipped with the system of electric bells, all drifts and sills are lighted with electricity. The engine is

32"x72" cylinder, made by the Montana Iron Works. The cable is 1"x7" thick. There are two double deck cages, 8 ton skips, attached. Timbering is done with square and round timber. The back filling system is used also.

The Mountain Con.

The Mountain Con mine employs 350 miners, 78 top men. Mr. James Brennan is foreman. Three compartment shaft down 2300 feet, and is equipped 4 deck cages, $\frac{1}{2}$ "x8" flat cable, 26"x72" cylinder Union Iron Works engine, and a system of electric call bells. This mine is timbered with round and square timbers. The air in the upper levels is fairly good, and the lower levels are greatly benefitted by a fan recently installed on the Green Mountain shaft which is 2100 feet deep, connecting with the 2200 foot level of the Mountain Con.

The Bell Mine.

The Bell Mine employs 100 miners, 10 topmen. Main shaft 600 ft. deep, three compartments and is equipped with 2 double deck cages, $\frac{1}{2}$ "x6" flat cable, engine is 28"x40" cylinder, made by the Chicago Iron Works. This mine is timbered with round and square timbers. W. B. Daly is the superintendent.

The High Ore Mine.

The High Ore mine has a three-compartment shaft down 2881 feet, and is given credit as being one of the best shafts in the Butte district. The equipment consists of a 32"x72" cylinder engine made by the Montana Iron Works. Two four-deck cages, $\frac{1}{2}$ "x7" flat cable. It has a thorough system of electric call bells. The ore is trammed with horses and motors. This mine is timbered with round timbers. It is one of the best ventilated large mines in the district. There is an extensive pumping plant attached to this mine. Aside from having its own water, it handles that of the Anaconda, Washoe and Parrot mines. The plant consists of three Dixon pumps, with a capacity of 1500 gallons per minute located on the 2200 ft. level, which hoists the water to the 1600 ft. level, where there are three similar sets of pumps that raise the water to the 900 ft. level where another set of pumps of the same capacity raise the water to the 300 ft. level, where there is an outlet that conducts the water to Meaderville, where it is used for precipitating. This pumping system will be changed from steam to electric power. The foreman of the mine Charles Ferns; miners employed 575, surface men 83.

The J. I. C. Mine.

The J. I. C. Mine, Jack Andrews foreman, men employed 87 miners, 12 surface men. The main shaft has three compartments 1000 ft. deep, equipped with an electric engine 1" round cable. They are not doing anything below the 800 ft. level.

The Belmont Mine.

The Belmont mine, Jack Andrews foreman, Men employed 45 miners, 18 surface men. Three compartment shaft, down to 2000 ft. level, 200 ft. being sunk in 1910. This shaft is equipped with Webster, Camp & Lane engine 38"x72" cylinder, flat cable $\frac{1}{2}$ "x7". The Company intends making this a permanent hoisting plant, for the south ledge of the Anaconda mine; also connected with the 1600 and 2000 ft. levels of the Anaconda, benefitting the Anaconda mine as regards ventilation.

The Right Bower Mine.

The Right Bower mine, Ed. Finnegan foreman. Employs 75 men, 4 surface men, shaft down 560 ft., three compartments. Also connected with Bakakalva.

The Original Mine.

The Original mine, Jerry Sullivan superintendent, Denny Shea foreman, 300 miners, 56 surface men, the main shaft is down 2400 feet. The workings are equipped with a Nordberg engine 32"x72" cylinder, $1\frac{1}{2}$ " round cable. Two double deck cages. Seven ton-skips, electric call bell system. The cages are cased in with iron on three sides, only hoisting from one side of the shaft. Trammig is done by men. This mine is timbered with round and square timbers using square caps with round posts and girts. In my opinion, this is a good system. It allows the laying of good floors, square cap, catching the girts better than a round one, as round caps are not uniform in size and are smaller at one end than at the other. This mine is closely filled and well timbered, the air being very warm in parts of this mine, but it has been recently purchased by the Anaconda company, it will be only a matter of a short time that the air conditions will be greatly improved by the connections which will be made with the Gagnon and West Stewart.

The West Stewart Mine.

The West Stewart mine, Dan Griffin superintendent, Mr. Conway foreman. This mine employs 140 miners, 16 surface men. The shaft is 2300 ft. deep, 2 compartments part of the

way and three the rest. Equipped with 32"x72" Nordberg engine, 1½" round cable, three double deck cages, with 7 ton-skips attached, electric call bell system. This mine is timbered with round and square timbers and well filled and in good condition. This mine also will be greatly benefitted in air conditions, having been recently purchased by the Anaconda Company, and will be able to connect with other mines.

The Diamond Mine.

The Diamond mine is equipped with a 32"x72" cylinder Ridsen engine, 1½"x7" cable, one single deck cage, with 8 ton skips, when lowering and hoisting men, two four-deck cages are used. Then changed when hoisting rock to one deck and skip. The main shaft is 2800 ft. deep, three compartment. The electric call bell system is used. This mine employs 440 miners, 71 surface men. Timbering is done with square sets round timber, stopes are well filled and the mine is in fair condition. Ventilation is greatly improved. The workings are being connected with the West Grey Rock on the 1400 ft. level, Green Mountain, Mt. Con on the 2200 ft. level. Also connected with the Cora on the 2200 ft level. W. B. Daly superintendent, Jack Dempsey foreman. They also have a large compressor plant which furnishes the Greyrock, Mt. Con, Diamond and Bell with air.

The Moonlight Mine.

This is one of the best timbered mines in this district, also well filled. Ventilation is good, with air connections with the Never Sweat and Anaconda and the Parrot. The main shaft has three compartments, down 1500 ft., equipped with a Dixon engine 20"x48" cylinder, flat cable ½"x6". Two double deck cages, electric call bell system. Timbering is round and square sets. Two hundred and fifty miners and 31 topmen. W. H. Price foreman.

The Poulin Mine.

The main shaft of the mine is down 1500 ft, but at present no work is being done below the 800 ft. level. The air in this mine is good, being connected with the Mt. Con and other mines. The Stella shaft is down to the 800 ft level. The property is equipped with 14"x18" engine, 1⅛" round cable; two double deck cages. Mr. Peters foreman. Men employed 270 miners, 24 topmen.

The Little Minah Mine.

The Little Minah Mine, Dan Griffin foreman, employs 200 miners, 19 surface men. The main shaft is 1200 ft. deep, three compartments and is equipped with Montana Iron Works engine 13"x37" cylinder, round cable, two double deck cages connects with the Mt. Con and West Stewart.

The Gagnon Mine.

The Gagnon mine, Jerry Sullivan superintendent, employs 375 miners, 45 surface men. Dan Sullivan foreman. The main shaft is down 2300 ft. Three compartment, equipped with a Dixon engine, 28"x48" cylinder, 1 $\frac{1}{8}$ " round cable, two double deck cages when lowering men, changing when hoisting rock, and putting on two three ton skips. Electric call bell system is in use. A Rand compressor drives 10 drills, two electric pumps have been installed with the capacity of 100 gallons per minute on the 200 ft. level, and one of 200 gallons on the 1000 ft. level. There are also sinking a three compartment shaft on the west end of the property and has attained a depth of 1035 ft., 725 ft. being sunk in 1910. This shaft is going to be a great help in the matter of ventilation. The intention of the company is to sink this shaft to the depth of the main shaft of the Gagnon, which is 2300 ft. deep.

Grey Rock Mine.

The Grey Rock Mine is down 1600 ft., timbered with round timbers framed into square sets. The air being good connections made with the West Grey Rock on the 1100, also connected with the Diamond. The mine equipment consists of a 20"x48" cylinder, Chicago Iron Works engine, flat cable, 1 $\frac{1}{2}$ "x6", two double deck cages, with electric call bell system. Twenty-eight drills are operated with a Norderg air compressor. Two hundred miners and 24 surface men. Ed Grimes foreman, W. B. Daly superintendent.

West Grey Rock Mine.

The West Grey Rock mine, Ed Grimes foreman, employs 12 surface men, 100 miners. The main shaft is 1100 ft. deep, with two single deck cages. This mine is also connected with the Grey Rock, and is a great benefit to the East Grey Rock, in the matter of ventilation.

Silver Bow Mine.

This mine has a three compartment shaft, depth 1000 feet.

It has 16"x42" cylinder, Alice engine, $\frac{3}{8}$ "x4" flat rope; 2 single deck cages, electric bell system. This mine is well timbered and well filled. Here connection is made with the Silver Bow No. 3, Pennsylvania and Berkley. Ventilation is good. The ore is trammed by horses and men. W. E. Kane foreman and employs 150 miners, 21 surface men. They have an 800 gallon per minute regularly pump installed at the 1000 ft. level, hoisting water to the surface.

Berkley Mine.

The Berkley mine, W. E. Kane foreman, employs 144 miners, 20 surface men. The mine has an 800 ft shaft, 2 compartments. Two single deck cages, 18"x32" cylinder, Ledgerwood engine, 1 inch round rope. This mine is timbered with both square and round timber. Ventilation is good.

Rarus Mine.

There are 65 miners, 35 surface men. The main shaft is 2300 ft. deep, 3 compartiment. It is equipped with a Webster Camp & Lane engine 32"x72" cylinder, flat cable $\frac{3}{8}$ "x7 $\frac{1}{2}$ ", two double deck cages with 6 ton skips attached. This mine is timbered with round and square timbers. The ore is trammed with mules, dumped into skip chutes at different stations and and hoisted automatically and dumped into the surface bins. Formerly considerable difficulty was experienced with ventilation but within the last two years they have sunk an air shaft, four compartments, to the 1600 ft. level and connected with raises to the lower levels. This shaft has a suction fan on top that is taking out 180,000 cubic feet of air per minute; also connects on the lower levels with Colusa, Pennsylvania and Tramway. Most all Rarus ore is hoisted through the Tramway shaft, being worked from that mine.

Tramway Mine.

Mr. George Moulthorp superintendent, Dave Moody foreman. Tramway employs 122 surface men and 504 miners. Three compartment shaft 2300 ft. deep, 200 feet being sunk in 1910. Equipped with a 32"x72" Alice Chalmers engine. Two double deck cages. Eight ton skips attached. This mine has installed a large fan on the 1700 ft. level for the purpose of ventilation, with a capacity of 40,000 cubic feet per minute; also connected with the Rarus and Leonard.

Mountain View Mine.

Mr. J. C. Adams superintendent, Dave Hendra foreman, employs 600 miners, 82 top mine, 3 compartment shaft down to the 2200 ft. level. It is fitted with the system of electric bells, Webster Camp and Lane engine, 28"x72" cylinder, flat cable 1"x7"; two double deck cages, 6 ton skips attached. The mine is timbered with round and square timbers, framed into square sets. Ventilation is fair having connections with the West Colusa, Pennsylvania and St. Lawrence; also connected with the High Ore on the 2200 ft. level. They have an air shaft almost completed to the 1800 ft. level, which is going to be a great benefit to the mine in the matter of ventilation.

Pennsylvania Mine.

Mr. J. C. Adams, superintendent; Mr. Jim McQuay, foreman. This mine employs 450 miners, 49 surface men. The main shaft is 1800 ft. deep, 3 compartments and electric call bell system. They have a 32"x72" Alice Chalmers engine, 1½" round rope. Two double deck cages, with 8 ton skip attached. This mine is well ventilated by a fan which is placed on the 1200 ft. level, conveying air through the different stopes and levels, also connected with the Mountain and West Colusa.

Leonard Mine.

Mr. J. C. Adams superintendent, Mr. Tom Mitchell foreman. The main shaft 1800 ft. deep. This mine is timbered with 12"x12" and 14"x14" square timber sets the ledge being very large and requiring strong timbers and closely filled. The stopes in this mine are worked in sections. They use approximately 1,000,000 feet of lumber per month, being so much timber used and requiring so much filling. It takes a large amount of air to be distributed to cause competent ventilation. The equipment consists of 32"x72" Norberg engine, single deck cages, with 8 ton skips attached. The ore is hoisted to the surface and dumped automatically into the ore bins. The mine employs 575 miners, 496 surface men. This mine has been greatly improved in regard to air since the completion of the new shaft, also re-timbering of old shaft, 1200 feet in 1910; also sinking and raising shaft to connect with the 1800 foot level which will be a great benefit to the mine. Also connected to the West Colusa, Pennsylvania and have two air shafts down to the 1000 foot level equipped with fans for the purpose of drawing hot air out of the mine.

West Colusa Mine.

Mr. J. C. Adams superintendent, Mr. A. J. Daum, foreman. The mine employs 350 miners, 43 surface men. The depth of the main shaft is 1700 feet. Three compartment, equipped with 2 three deck cages, Norberg engine 30"x60" cylinder, 1½"x6" flat cable. Electric bell system is used. This mine is well timbered, well filled, and in splendid condition. The ore is trammed by horses. Ventilation is secured by connection of the Comanche shaft, Alex Scott and Leonard, with two raises to the surface. This mine is one of the best ventilated large mines in the district.

East Colusa Mine.

Mr. J. C. Adams superintendent, Mr. Joseph Richards foreman, the mine employs 8 surface men and 100 miners. Three compartment shaft to 900 foot level. Steam engine 10"x14" is used, single deck cage. This mine is well timbered and in splendid condition.

The Badger Mine.

Mr. J. C. Adams superintendent, Mr. Renwaldt foreman. The mine employs 24 surface men, 100 miners. The main shaft 1800 feet deep, 400 being sunk in 1910. Alice Chalmers engine, 32"x72" cylinder, ½"x7" flat rope. Two single deck cages. This mine is one of the new producers of the year 1910, having encountered ore on the 1300 and 1800 ft. levels; connected with the North Butte on the 1400 ft. level and 1800 ft. level, also connected with the Diamond.

The North Butte Mine.

The mines worked by this company are the Speculator, the Edith May and Jessie. Mr. John D. Pope, general manager, and Mr. Lombard superintendent, Mr. Don Courtney foreman. The main shaft is 2600 feet, 200 feet being sunk in 1910. Three compartments, equipped with a 32"x72" cylinder Norberg engine.

The above claims are all worked through one shaft. This mine is timbered with 10"x10", well filled and in good condition. This mine has been very warm in the lower levels, but they have recently made a connection with the Badger on the 1800 ft. level, also have sunk Granite Mountain shaft 1200 ft., in 1910, and only lack about 75 feet of having this connection to the 1800 ft. level, which will be a great benefit to the mine in regard to air. There are 780 men employed by the company.

The Elm Orlu Mine.

Mr. Case foreman. This mine employs 120 miners, 25 surface men. Montana Iron Works engine, 16"x37" cylinder, 1 1/8" round rope, 2 single deck cages. Main shaft three compartments to 1200 foot level, 200 feet being sunk in 1910. Also connected to the Poser.

Poser Mine.

Mr. Kilgallon foreman. Main shaft 300 feet deep, works 20 miners and 10 surface men. This mine is in good shape, connected to the Elm Orlu.

The Pittsburgh & Montana Copper Company.

Also East Butte.

The East Butte has one of the most complete surface plants in this district, Mr. Oscar Rohn being superintendent, and Mr. Andy Ray foreman. This mine employs 150 miners, 100 surface men. Shaft No. 1, 3 compartment down to 1200 foot level, being equipped with a 15"x30" steam engine, 1 1/8" round cable. Two single deck cages, with skips attached. No. 2 also 3 compartment shaft, to the 1200 foot level, equipped with a Griffith & Wedge engine, 16"x32" cylinder, 1 1/8" round cable, 2 single deck cages with skips attached. This is the main working shaft. This mine is timbered with 10"x10" round timbers. The air in the working is good. The 2 shafts being connected with a 2000 ft. crosscut, it gives a good circulation. This mine is well timbered. Besides the machinery equipment stated there is an Ingersoll-Sargent compressor besides having an extensive pumping plant. Within the last two years they have installed their own smelter and concentrator, where ore from their properties are treated, as well as customs, having been run for the past summer it has given good satisfaction.

Ballakalava Copper Company.

Mr. Newton superintendent and Wilbur Hauswirth foreman. This mine employs 30 miners, 18 surface men. Shaft 1400 feet deep, 3 compartments, 2 single deck cages. Equipment consists of 160 horse power hoist, power electric, double drum engine, also one steam engine 10"x12" cylinder. The air compressor good for 15 drills.

Butte Superior Copper Company.

The Black Rock mine, Superintendent Mr. Atwater, Angus McLeod foreman. The mine employs 75 miners, 20 surface

men. This company has a large amount of ground and are doing the development work through the Superior shaft. The shaft is 1,600 feet deep, three compartments, two single deck cages. Equipment consists of Fraser & Chalmers engine 20x60 inch cylinder, Sullivan air compressor, good for 12 drills. They also have a large boiler plant consisting of five 100 horse power boilers, one 250 horse power boiler, and have also installed an electric pump on the 1,200-foot level. This mine within the last year has opened up some large zinc ore bodies, which they are treating at the old Heinze concentrator at Basin.

Butte-Montana Mine.

Mr. Stone superintendent. Mr. Jack Stewart foreman. Shaft is down 1,600 feet deep. Three compartments, one single deck cage, one steam engine, Ledgerwood make. Fifteen miners and six surface men are employed. This mine is connected with the West Colusa on the 1,200 and 1,400 foot levels.

Tuolumne Mine.

Superintendent Mr. Pay Sheehan, Mr. Harrington foreman; 100 miners and 15 surface men. Three-compartment shaft to the 1,400-foot level. Henderson & Boothoff engine, 1 inch round cable, two single deck cages. This mine within the last year has become one of the large producers. It is well timbered, well filled and in splendid condition; connected to the North Butte.

The Davis-Daly Mines.

Davis-Daly consists of the Smokehouse, Mount Moriah and Silver King and the Colorado. Mr. Al Frank, general manager; Mr. Stadler, foreman. This mine employs 20 topmen and 40 miners. All work is being done through the Colorado shaft, which is 1,800 feet deep. Three compartments. The equipment consists of a Ledgerwood engine, 12x16 inch cylinder, 1-inch cable, two single deck cages, air compressor good for ten drills.

Raven Mine.

The Raven mine, operated by the Raven Mining Company, of which John Morsey is foreman, has an incline shaft that has been sunk to a depth of 1,300 feet, some 200 feet having been accomplished during the year. Several thousand feet of exploring has been done on the various levels on the strike of the vein, which is highly mineralized, the values being

copper and silver. The main shaft will be extended to ascertain the continuity of the ore bodies at a much greater depth. The vein carries high values in copper.

Butte Central Copper Company.

The mine operated by this company is situated in the southern part of the Butte district and has been in operation for the past two years, in which time a great deal of exploring has been done on the various levels, some 1,200 feet having been accomplished, showing some very high grade ore containing gold, silver and copper. There are 30 men employed. The shaft has a depth of 500 feet and is equipped with all safety appliances. Under the management of Sam McConnell.

—

—

